Member of Associated Business Papers, Inc.

Member of Society for Electrical Development, Inc. *Member of Audit Bureau of Circulations*

Electrical Review

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. 70—No. 25. CHICAGO, SATURDAY, JUNE 23, 1917. PAGE 1037.

The Metric System and the War

THE many political, social, and economic changes that are now taking place, and that will continue to develop for a long time as a direct result of the war, will be followed by no less remarkable changes in the industrial life of the people of the countries now devastated by war. Many of the developments that are now taking place have been discussed in the public press, but one of the greatest of practical importance—the increased use of the metric units of weights and measures—has been scarcely mentioned.

As a result of war orders, factories all over the land are turning out products according to metric measurements, and thousands of workingmen are becoming as familiar with the centimeter and the gram as they were with the foot and the pound. That this widespread use of the metric system will cease after the war is doubtful, and it certainly would be regrettable were such a retrograde movement to take place.

About the only cogent argument against the universal adoption of the metric system heretofore heard was to the effect that its adoption involved serious difficulties in the adaptation of the various mechanical appliances of manufacture to a radically different scale. While such an argument was convincing in the past, its validity has been quite destroyed by the comparative ease with which adjustments were made to meet the exigencies of war.

When peace again spreads her benign influence over the war-distressed countries, and the people turn their attentions to productive industry and trade, the demands for goods will come from countries in which the metric system is the only one used. In order that American goods may find ready markets in these countries, they must be made according to the scales there prevalent. The necessity for the adoption of the metric system by the manufacturers of this country is thus evident.

The war has accelerated the employment of the metric scale, and the gains so far made can be further increased if proper efforts are put forth. The engineering organizations of the country should take the initiative in this matter. The electrical engineers have been the pioneers in advocating the adoption of the metric system of weights and measures, but some of their brethren have been much more conservative. The mechanical engineers still cling to the pound, the foot and Fahrenheit degree of temperature. The war has shown many of them that the meter, the kilogram and the centigrade scale are entirely practical and much more convenient. When we recall that the National Wholesale Grocers' Association is in favor of giving financial and moral support to the metric-system propaganda, it seems incomprehensible that any representative of the engineering profession, to whom a simple scale is so important, should oppose the adoption of a tool so useful and efficient.

Now is the time for the engineering organizations to combine their efforts with those of other organizations interested in the metric cause, and work for its adoption not only in this country, but in all English speaking countries. The first step should be to convince the commercial organizations of the country that our present system of weights and measures is injurious to our foreign trade and is wasteful of vast amounts of their most precious commodity—time. In many instances the business organizations are almost persuaded so that the final or complete conversion should not be difficult. We believe that right now is the opportune time to make the metric system the National as well as the International language of commerce and industry.

Where the Electric Vehicle Has Failed

THE cost of fuel averaging from 2 to 5 cents per mile for passenger cars, and considerably more for commercial cars, has become an important element in the operating expense of the gasoline vehicle. At a recent meeting of the American Chemical Society, it was shown that gasoline motor cars have increased eight-fold during the past seven years while the production of gasoline has increased only four-fold during the same period. Today the country is faced with a real famine in gasoline, a situation that is giving much concern to those who have the facts available.

In direct contrast to this condition the cost of electricity has steadily decreased, rates for residence service as low as 2 and 3 cents per kilowatt-hour not being uncommon in these days of electric cooking. And, when it is considered that the average electric passenger vehicle can travel about 3.5 miles with an

expenditure of one kilowatt-hour of energy, it is but natural to ask why the electric vehicle is not today the biggest factor in automobile development, ready to assume its logical position as the most economical unit for city transportation.

The most radical gasoline-car enthusiast must admit that the electric vehicle has many inherent advantages. For instance, the simplicity of the electric's mechanism, consisting mainly of a standard electric motor, controller, and storage battery is an important advantage. Likewise, the freedom from starting troubles and water freezing in winter, and ease of operation, freedom from objectionable odors, etc., are all points which merit consideration. But in spite of these many advantages the growth of the business, while considerable when taken alone, has been ridiculously small when compared to the wonderful growth of the gasoline automobile business.

There are many factors which can be held responsible, chief of which, perhaps, is lack of enthusiasm shown by the manufacturers for their own product. This enthusiasm, which is such an important element in the gasoline automobile field, was expected of the central-station companies. Since the charging of batteries is a desirable load, it was but natural, perhaps, for the vehicle manufacturers to feel that the central station should be willing to assume the burden of introducing the vehicle and standing sponsor for it, as in the case of the electric flatiron, percolator, or other appliance. In fact, the electric automobile was originally classed as a current-consuming device, and an attempt was made to market it on this basis rather than along the broad merchandising lines which the gasoline-automobile industry found so successful. Meanwhile, the gasoline-car manufacturers, instead of placing the burden of development on the fuel producers adopted sales policies, commensurate with the importance of their product, which have established a new era in merchandising. They were quick to realize that distribution through dealers was the only satisfactory and economical method of selling automobiles. By means of such a system, active representation was obtained in every community, regardless of size, and at a minimum of expense.

Even at the cost of a substantial discount it is generally to the manufacturer's advantage to sell through the dealer. In the long run it is cheaper, except in the large centers, and where a dealer can be signed for a definite number of vehicles per year, it steadies the manufacturers' production, distributes the burden of introductory selling and, altogether, is a safer and wiser method of securing distribution.

Another factor which has greatly retarded the development of the electric passenger car business, has been the high first cost of these vehicles as compared with the gasoline machine. While it is undoubtedly true that the electric compares very favorably in both price and appearance with the closed gasoline automobile of the limousine type, still the field for the sale of such cars is decidedly limited, and the electric manufacturers by their persistent adherence to this one type of vehicle have automatically limited their sales to a comparatively small field.

There is still an opportunity for the electric vehicle to assume the position to which it is entitled if manufacturers will break away from the old traditions and market the electric as an automobile first, and give secondary consideration to its close affiliation with the electrical industry and to central-station co-operation, which will be inevitable.

PRESIDENT WILSON SEES NO SUFFICENT REASON FOR FOREGOING CONVENTIONS.

Believing that conventions of trade, commercial and professional organizations are even more necessary and advantageous now than in times of peace, and that the cancellation of annual meetings because of the war are due to mistaken notions of economy, the Merchants' Association of New York asked President Wilson to discourage the postponement of conventions.

In a letter to President Wilson, William Fellowes Morgan, president of the Merchants' Association, wrote as follows:

"It has come to the attention of the Merchants' Association of New York that there is a tendency to forego the holding of conventions and general commercial meetings by business interests of the country because of a desire to practice alleged economy during the war.

"In our judgment this is a false idea of economy, the application of which will be harmful, rather than beneficial, both to the Government and to the Nation's business. Such gatherings, in our judgment, should be encouraged rather than discouraged, because failure to hold them as usual is likely to create a false impression, to stimulate a lack of business confidence and to discourage mutual co-operation which is so necessary under existing circumstances. Conventions and gatherings of different trades and industries afford an exceptional opportunity on the part of business men composing them to study the effect of the war situation upon industries, so that they may be best equipped to serve the needs of the Government and to serve the normal business of the country. Both business and general conventions also afford exceptional opportunities for patriotic gatherings and the fostering of patriotic sentiment.

"We, therefore, respectfully suggest that, if in your judgment the continuation of such meetings is beneficial, a public utterance by you to that effect would be of value and would have a marked influence both in stimulating such gatherings and in perpetuating the results flowing therefrom. It seems to us that if ever the citizens of this country should get together, whether in business or general organization meetings, it is during such a period as that through which we are now passing."

The following response has been received:

THE WHITE HOUSE
Washington, June 8, 1917.

My Dear Mr. Morgan:

The President asks me to acknowledge the receipt of your letter of June 6th, and to say that he agrees with you that there is no sufficient reason for foregoing the holding of conventions and general commercial meetings by business interests, so far as he can see.

Sincerely yours,
J. P. Tumulty,
Secretary to the President."

HAPPENINGS IN THE INDUSTRY

Jovian Congress Meets in Chicago—Winners in Wire Your Home Contest Announced—Electric Power Club Meeting—Committee on Gas and Electric Service Formed—Miscellaneous News Notes

FIFTEENTH JOVIAN CONGRESS MEETS IN CHICAGO.

Annual Convention to Be Held as Usual—Insurance Plan Approved—Other Matters Considered.

In accordance with a call issued by Reigning Jupiter Henry L. Doherty, a meeting of the fifteenth congress and past Jupiters of the Jovian Order was held in Chicago, at the Hotel Sherman, June 12 and 13, 1917. The meeting was called to order with Jupiter Doherty in the chair and Mercury Bennett as secretary.

Mr. Doherty announced that the meeting was called for the purpose of discussing the report of the Special Commission, made at Cleveland April 3 and 4, 1917, and for the consideration of other matters relating to the progress of the Order and the possible changes in its method of operation, as suggested by numerous Jovians through the medium of the central office.

At the request of the chair, the secretary read a paper giving briefly the subjects for discussion as covered by the preceding paragraph.

ANNUAL MEETING.

It was unanimously resolved that the annual convention of the Jovian Order be held at the time set by the Jovian constitution, to-wit: within ten days of October 15; however, that all forms of entertainment be omitted and the character of the meeting be strictly that of a business gathering called and conducted for the purpose of transacting the necessary business of the Order. The resolution also provided that a patriotic dress should be given to the convention as a proper manifestation of the patriotism and loyalty of the Jovian Order to its country in this time of need.

It was decided that the attendance of the meeting be promoted in every possible way consistent with the money available for that purpose, also that the place and date of meeting be selected by Jupiter Doherty.

JOVIAN INSURANCE.

At the request of the chair, Mercury Bennett read a complete report of the progress to date of the plan to furnish Jovians with accident and health insurance at a rate some 50 per cent less than that for which it could be secured in regular channels. The meeting expressed unanimous approval of the plan, and confidence in its furnishing to the individual Jovian the tangible dollars and cents return which he has desired.

DOHERTY PLAN.

Jupiter Doherty gave a brief sketch of his plan to provide Jovian leagues with development work, closing with the statement that the first operation would require an investment of quite a large sum, and that he believed the time inopportune to solicit such a sum from the industry.

The meeting unanimously agreed that the operation of the plan be postponed until conditions were more propitious to its best development.

CLEVELAND COMMISSION REPORT.

A general discussion upon all of the matters contained in the Cleveland Commission report and presented before the commission was carried on during the greater part of Tuesday, June 12, until 11 p. m., and Wednesday from 10 a. m. to 2 p. m.

The discussion revolved mainly upon the point of whether or not the distribution of the present dues of $4.00 should be made in a manner to reduce the amount coming to the central office and increase the amount going to the local league. Closely connected with this question was that of the possibility of decreasing the present expense of the central office, which was given earnest consideration.

By the unanimous consent of the meeting, Jupiter Doherty was authorized to appoint a committee of five, who would be instructed to meet as often as necessary prior to August 1, to thoroughly analyze all questions, and to make a complete report of its decision to a meeting of Congress and Past Jupiters to be called not later than August 20.

This action was taken for the reason that the meeting did not represent a quorum, and that, therefore, any decisions it might reach would not be official. Further because many of the questions required exhaustive investigation that would cover too extended a period to make possible for the meeting to remain convened until the information could be secured.

It was understood that Jupiter Doherty would personally impress upon members of Congress the absolute necessity of attending the next meeting, and that every other possible effort would be used to obtain the necessary quorum, which it was believed could be secured.

Jupiter Doherty set forth a possible solution to the problem of the distribution of Jovian dues of $4.00 in a manner that would be satisfactory to all concerned. The suggestion was concurred in by all those present and was recommended for the consideration of the committee with a view to working the suggestion out in its practical details of operation.

Briefly, the plan is as follows:

First, that it is obvious, from figures showing the present membership and the minimum possible expense of operating the Jovian central office, that it would be disastrous to contemplate any reduction of the proportion of the dues now going to the central office, unless positive assurance could be given of a proportionate increase in membership.

Second, that some incentive should be given to the local league to make sincere and earnest efforts to increase its membership and a reward offered commensurate with the results secured. It was believed that these matters could be met by an arrangement whereby the maximum dues to the national office would be $4.00 and the minimum dues $2.00; that the amount of dues, or rather the per capita tax paid by the local office to the central office should be determined by the number of Jovians in good standing represented in its membership; that a bogy be established for each league based upon the population of its city, and that the nearer the Jovian membership approached the bogy the nearer it likewise would approach the minimum per capita tax of $2.00; that the reduction be made in steps at certain stated periods during each year until the minimum figure had been reached.

The meeting felt that while it was entirely possible for it to come to some sort of decision on all of the matters which

it had considered, it would be unwise to do so because of the fact that while its deliberations had done much to clear the atmosphere of doubt in connection with many matters, it would be best to have a careful investigation by a smaller committee, with revision by a full majority of Congress and Past Jupiters, to be submitted to the regular annual convention for final approval or rejection.

Conditions will not permit a special meeting of the Order prior to the annual convention. Therefore the meeting of Jupiters and Congress prior to August 20 will be in ample time to make recommendation for constitutional changes at the first meeting at which such changes could be made.

WINNERS OF THE "WIRE-YOUR-HOME TIME" PRIZE CONTEST.

Society for Electrical Development Gives Out List of Successful Contestants—37 Prizes Awarded.

Announcement is made by G. M. Sanborn, president, Sanborn Electric Company, Indianapolis, and chairman of the "Wire-Your-Home Time" committee, of the prize winners in the $1250 prize contest conducted by the Society for Electrical Development in connection with the nation-wide house-wiring campaign, April 1 to May 15.

While the campaign was participated in by hundreds of lighting companies and dealers, the prize contest was restricted to members of the Society only. The Society offered 35 prizes.

Mr. Sanborn announced the following prize winners, the houses wired and watts connected:

CLASS "A"—CITIES LESS THAN 15,000.

Prizes.		Name and city.	Houses wired.	Watts conn.
1st	$150.00	Robert Lee Ralston, Manistee, Mich.	119	39,270
2d	50.00	Charles H. Van Gorder, Oelwein, Iowa.	96	33,172
3d	10.00	Victor O. Stafford, Humboldt, Iowa.	83	35,000
4th	10.00	Frank P. Gaireus, Ridgway, Pa.	69	28,980
5th	10.00	G. Faul Cox, Wilmerding, Pa.	46	25,000
6th	10.00	S. A. Lipscombe, Bartlesville, Okla.	43	14,000
7th	10.00	Thomas J. McGee, Duryea, Pa.	40	10,000
7th	10.00	Robert E. Martin, Kankakee, Ill.	40	18,150
Total Class "A"			536	203,572

CLASS "B"—CITIES 15,000 TO 50,000.

Prizes.		Name and city.	Houses wired.	Watts conn.
1st	$150.00	Fred Vos, Muskegon, Mich.	109	35,425
2d	50.00	Alvin L. Dunmire, Elmira, N. Y.	100	48,000
3d	10.00	David C. Calhoun, Springfield, Mo.	91	33,735
4th	10.00	Henry Austin Pendergraph, Durham, N. C.	83	23,000
5th	10.00	Floyd A. Root, Lockport, N. Y.	82	52,240
6th	10.00	William J. Graham, Joliet, Ill.	74	46,600
7th	10.00	J. M. Killian, Perth Amboy, N. J.	64	51,700
Total Class "B"			603	290,700

CLASS "C"—CITIES 50,000 TO 100,000.

Prizes.		Name and city.	Houses wired.	Watts conn.
1st	$150.00	Morris G. Saunders, Flint, Mich.	147	117,600
2d	50.00	Lawrence B. Brown, Chattanooga, Tenn.	72	36,000
3d	10.00	Herbert E. Shelton, Wilmington, Del.	50	50,000
4th	10.00	Elmer E. Fouratt, Trenton, N. J.	50	37,500
5th	10.00	James H. Clark, Bayonne, N. J.	40	30,000
6th	10.00	C. B. Parks, Chattanooga, Tenn.	33	16,500
7th	10.00	Lewis C. Dye, Chattanooga, Tenn.	25	12,500
Total Class "C"			417	280,100

CLASS "D"—CITIES 100,000 TO 500,000.

Prizes.		Name and city.	Houses wired.	Watts conn.
1st	$150.00	John J. Montgomery, Syracuse, N. Y.	116	42,010
2d	50.00	T. Vinton Carpenter, Cincinnati, O.	111	85,000
3d	10.00	William R. Adams, Newark, N. J.	68	65,400
4th	10.00	Joseph M. Walsh, Scranton, Pa.	56	20,550
5th	10.00	F. W. White, Cincinnati, O.	55	55,000
6th	10.00	Franklin Reynolds, Scranton, Pa.	47	14,350
7th	10.00	Albert Rodenhuis, Grand Rapids, Mich.	47	30,180
Total Class "D"			500	322,690

CLASS "E"—CITIES 500,000 AND OVER.

Prizes.		Name and city.	Houses wired.	Watts conn.
1st	$150.00	R. A. Le Comte, Chicago, Ill.	110	130,700
2d	50.00	Arthur J. Kay, Chicago, Ill.	108	119,150
3d	10.00	Fred T. Wing, Chicago, Ill.	82	115,800
4th	10.00	James A. Gordon, Chicago, Ill.	77	80,400
5th	10.00	Sidney G. Powell, Chicago, Ill.	61	97,700
6th	10.00	F. L. Richardson, Chicago, Ill.	59	48,300
7th	10.00	Wendell King Bridgman, Chicago, Ill.	55	50,700
7th	10.00	George Lovett, Philadelphia, Pa.	55	73,500
Total Class "E"			607	716,250

In two classes there were two winners of the seventh prize, so that 37 prizes had to be awarded.

The 37 prize winners wired 2663 houses, an average of 72 houses each, or an average of two houses during each working day during the six weeks of the contest. Their sworn reports show that these 37 men connected up 1813 kilowatts, an average of 49 kilowatts each.

Over 10,000 Houses Wired.

Less than 50 reports from other sources than members or contestants show that salesmen not eligible for entrance in the campaign contracted for wiring over 10,000 houses. In most instances the following were the favored three plans for securing contracts: the flat rate per outlet, per room, or for the complete installation.

One of the outstanding reports of the country is that of the Public Service Electric Company of New Jersey. This public utility prepared its campaign by inaugurating electric clubs in its different cities, thereby promoting active participation by contractors, and then used a flat rate per outlet basis.

During the campaign, this company obtained contracts for 1349 old houses wired, as against 821 during the wiring campaign in 1916. This is an increase of 64.3 per cent.

Although costs entering into house wiring this year far exceeded those of last year, practically every company showed large increases over 1916.

The Society's clipping bureaus checked nearly 60,000 column inches of newspaper space purchased by local electrical interests. A conservative estimate would be that from $75,000 to $100,000 were spent by these interests in newspaper advertising during the campaign.

Minneapolis Jovian League Meets.—A combination educational and entertainment meeting of the Minneapolis Jovian League was held on the evening of June 21, Martin J. Wolff, of Jovian fame, having been the principal speaker. Mr. Wolff's address was concerning the part the electrical industry was destined to play in the great war. The Minneapolis League is making plans for an electrical palace at the Minnesota State Fair this summer. Practically every dealer and contractor of that city has signified a willingness to co-operate with the league to the fullest extent in this movement.

ELECTRIC POWER CLUB MEETS IN WASHINGTON.

Resolutions Offering Co-operation with Government Adopted—New Officers Elected.

Resolutions offering co-operation with the government in the time of its need were unanimously adopted by the Electric Power Club in eighth annual convention at the New Willard Hotel, Washington, D. C., June 11 and 12. The meeting, which was originally planned for Hot Springs, Va., was all business, no entertainment features being provided.

The various standardization committees recommended some slight changes in standards and adopted some new ones. Reports were made by the Fractional Horsepower Motor Committee, Large Power Motor Committee, Transformer Committee, Mining Locomotive Committee, U. S. Bureau of Mines Committee and Industrial Control Apparatus Committee.

In order to meet government and other similar requirements regarding name-plate markings, the general engineering recommendations committee has suggested that where the name-plate clearly indicates the specifications to which the apparatus conforms it is not necessary to give the detailed information specified in the rules of the club. The fractional horse-power committee recommended that the following name-plate markings be adopted as standard for fractional horsepower motors: For direct-current motors, (a) manufacturers' type and frame designation, (b) horsepower output, (c) time rating, (d) temperature rise, (e) revolutions per minute at full load, (f) voltage, (g) full-load amperes, (h) winding, shunt, compound or series; for alternating-current motors, (a) manufacturers' type and frame designation, (b) horsepower output, (c) time rating, (d) temperature rise, (e) revolutions per minute at full load, (f) frequency, (g) number of phases, (h) voltage, (i) full-load amperes.

The Manufacturers' Council delegates reported on the meetings held by the Manufacturers' Council showing progress.

The Committee on Cost Accounting had as its feature C. E. Patterson, comptroller for the General Electric Company, who gave a very good talk on that subject as pertaining to the electrical industry particularly. He made reference to the report as chairman of a Uniform Account Committee appointed by the Electrical Manufacturers' Council. He urged very strongly the adoption of this report, which contains a schedule of accounts by the various manufacturers represented at the meeting. He also invited criticisms and suggestions, so that the committee could go on immediately with further work on this subject.

A suggestion for publishing the Electric Power Club Book of Standards in foreign language for distribution to Central and South America was favorably acted upon.

A resolution tendering to the government the use of the manufacturing plants of the members and offering the services of the committees of the Electric Power Club was passed. This resolution has been sent to the President.

A resolution was also passed covering the purchase of Liberty bonds with the surplus cash now in the bank.

Mr. Gifford, of the Advisory Committee of the Council of National Defense, outlined briefly the scope of that committee's work and the manner in which they co-operate with the manufacturers. He advised the members present how they could best co-operate at the present time. Representatives of the Navy Department were present and spoke briefly. Paymaster Hancock advised how the Bureau of Supplies and Accounts arranges for purchase of material for the Navy. Lieut. Sharpe outlined the work of the Bureau of Steam Engineering in the making up of schedules and testing apparatus.

The following officers were elected:

President, C. L. Collens, Reliance Electric & Engineering Company.

Vice-president, F. S. Hunting, Ft. Wayne works of the General Electric Company.

Secretary-treasurer, C. H. Roth, Roth Brothers & Company.

There were no other changes in the board of governors, which now consists of the president, vice-president, secretary and treasurer in addition to the following: James Burke, Burke Electric Company, Erie, Pa.; J. C. Hobart, Triumph Electric Company, Cincinnati, Ohio; J. R. Jeffrey, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.; T. E. Barnum, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; W. A. Layman, Wagner Electric Manufacturing Company, St. Louis, Mo.; S. L. Nicholson, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; H. C. Petty, Crocker-Wheeler Company, Ampere, N. J., and R. J. Russell, Century Electric Company, St. Louis, Mo.

COMMITTEE ON GAS AND ELECTRIC SERVICE FORMED.

Representative of American Gas Institute and National Electric Light Association to Co-operate With Government.

Some months ago the committee of the American Gas Institute to co-operate with the government in regard to the military needs of the nation and the committee of the National Electric Light Association on war conditions, at a joint conference held in New York City, decided to organize a national committee which would secure to the United States government the most effective co-operation in the conduct of the war from the gas and electric light and power industries. The National Committee on Gas and Electric Service was thereupon organized with a membership of representative men from these two industries and the related natural-gas industry. The committee, as constituted, is as follows:

Walter R. Addicks, vice-president, Consolidated Gas Company of New York, New York, N. Y.

Philip P. Barton, vice-president, Niagara Falls Power Company, Niagara Falls, N. Y.

John A. Britton, vice-president, Pacific Gas & Electric Company, San Francisco, Cal.

Alex Dow, president, Detroit Edison Company, Detroit, Mich.

Charles L. Edgar, president, Edison Electric Illuminating Company of Boston, Mass.

A. E. Forstall, president, American Gas Institute, New York, N. Y.

Joseph F. Guffey, president, Natural Gas Association of America, Pittsburgh, Pa.

Samuel Insull, president, Commonwealth Edison Company, Chicago, Ill.

D. C. Jackson, professor of Electric Engineering, Massachusetts Institute of Technology, Boston, Mass.

Joseph B. McCall, president, The Philadelphia Electric Company, Philadelphia, Pa.

Capt. William E. McKay, vice-president, New England Gas & Coke Company, Boston, Mass.

Herbert A. Wagner, president, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.

S. S. Wyer, consulting engineer, Columbus, O.

John W. Lieb, vice-president, The New York Edison Company, chairman of committee, New York, N. Y.

William H. Gartley, vice-president, Equitable Illuminating Gas Light Company of Philadelphia, vice chairman of committee, Philadelphia, Pa.

George W. Elliott, secretary of committee, Washington, D. C.

The committee is recognized by the Advisory Commis-

sion of the Council of National Defense as one of its advisory committees, and it has established an official headquarters in the Munsey Building, Washington, D. C., where it has placed itself at the service of the government for any assistance it may be able to render in behalf of the public utility industries it represents. It is prepared to act as a vehicle of communication between the various instrumentalities organized by the government for the conduct of the war and the gas companies producing and distributing artificial and natural gas and the electric light and power companies furnishing electric service, in all matters relating to national defense. It proposes to promptly place at the disposal of the government any data or information which it may require as to the facilities in men or service which they may have available, ensure the continuous operation of their plants so as to enable the munition plants, navy yards and manufacturing establishments, through continuous and uninterrupted service, to maintain their maximum output, and it will endeavor to provide the government with the necessary quantity of the essential by-products they can make available for the production of high explosives and of ammunition.

One of the most essential requirements in the co-ordination of the industrial resources of the country for the successful conduct of the war is to provide a regular and adequate supply of fuel to the important utilities engaged in enterprises through which they render service to the government and to the public. To facilitate solving the many problems affecting the continuous supply of fuel to operate their plants, the National Coal Board has been pleased to appoint George W. Elliott, secretary of the committee, to membership on the Coal Committee. A questionnaire is now being prepared which will, within the next few days, be forwarded to every gas and electric light and power company in the country, asking them to send a statement of the various kinds and quantities of fuel each uses per annum for its various purposes, the water or rail connections over which they are received, together with a monthly statement of fuel contracted for, received and consumed. This will enable the committee to give prompt information to the authorities of fuel shortage in any particular locality, with the transportation lines involved, loading and unloading delays, car shortages, routing and trans-shipment difficulties, etc.

The committee has been in consultation with the authorities on matters affecting the service which the employees of the companies may render to the government and in regard to various questions connected with selective registration, conscription exemptions and provision for the dependents of employees who may be called upon to render military service. The furnishing of heat, light and power service to the troop cantonments for the mobilization of the military forces located in different parts of the country is now being considered and information is being collected as to how these agencies may be made available to the camps in the shortest possible time from the nearest points of supply.

It is believed that this national committee on gas and electric service can be of great assistance to the government in these several directions and that it will cover a broad field of useful and patriotic service, bringing to bear on the successful conduct of the war, from the standpoint of efficient industrial mobilization, the vast resources of men and facilities which the utility companies of the country have at their command and through which they are now efficiently serving the public and which they desire to make available to the nation to the greatest practicable extent.

Kansas City Plant Bases Charges on Cost of Coal.—The municipal electric light plant of Kansas City, Kans., on June 13 entered into its first sliding-scale contract to furnish power, the price to be based on the price of coal. The contract was made with Morris & Company, packers, and involves $2,000 monthly revenue to the city.

NEW YORK ELECTRICAL EXPOSITION TO BE HELD.

Elaborate Display of All Economic Agencies to Be Made a Factor in Helping to Win War.

The New York Electrical Exposition for 1917 will be devoted principally to showing how, through the varied applications of electric energy, our daily industrial, commercial and home activities may be placed upon a higher plane of efficiency and economy. Exhibits will show methods to conserve life and health; to increase efficiency in manufacturing and commerce; to eliminate physique-exhausting drudgery from home and factory; to eliminate coal waste, now an economic question of the highest importance; the latest applications in aid of the medical and surgical professions, and many other purposes, lending themselves seriously and patriotically to the highest interests of the nation.

Federal Government Exhibits.

It seems particularly appropriate that the National Government, in addition to its naval and military exhibits, will make a special exhibit from the agricultural department, to encourage higher efficiency and greater productiveness in farm and garden effort. The government exhibits will tend to encourage enlistment and a larger measure of public support in the military and naval effort of the day, and will show the extent to which the enlisted man may develop advantageously, from a broad educational standpoint, during his period of service.

Electricity for the Army and Navy.

Electricity is playing an extraordinary part in modern army and naval life. It not only increases the efficiency of the offensive, but aids in innumerable ways in transportation, camp sanitation and the various stages of hospital work, lessening the suffering of the injured, on the one hand, and, on the other, more quickly securing their cure and the resumption of their normal activities. Special effort will be made to show the many uses of electricity in these particular fields.

Coal Economy.

Perhaps one of the most serious questions of the moment is the adequate supply of coal to our own country and Europe. Through electrical agencies one ton of coal can do the work of from two to ten tons. Careful engineering studies are being made to ascertain how most effectively this can be shown.

Office Efficiency.

If we are going to be a nation organized and conducted along lines of highest human efficiency, waste of any kind, whether mental, physical or material, must be lessened, and, if practicable, eliminated. Every form of human effort must be conserved most carefully. Obsolete methods must be taken from the office and accounting room, in which electrically operated machinery is being rapidly substituted for exhausting mental processes.

Home Labor.

Probably a larger degree of attention will be given to the elimination of labor in the home than ever before. Women are beginning to realize, with the educational work of the past, that home drudgery not only means a badly kept and less attractive home, in which it is difficult to retain contentedly the members of the family, but that through exhausting labor they are less useful and efficient in the family life and they early pass on to the human scrap heap. The home labor problem is becoming increasingly difficult. Electrical appliances not only do the things needed, but they lighten the burdens upon domestic service, making its reten-

tion easier, and that which is retained of a much more satisfactory character.

ELECTRIC VEHICLES.

Few realize the enormous cost of secondary transportation, especially in the larger cities. It has been said that this secondary cost is sixteen times as great as the cost of the transportation of freight upon all the American railroads. The comparison seems reasonable, when remembering that every particle of food and household supplies, fuel, building material, when remembering that everything that enters into any feature whatever of our daily life, must be transported from some terminal to the point of consumption. Frequently —almost always—there are several stages of transportation. It has been truly said that the delivery service of a large city adds materially to the cost of living. In these days of economy nothing is of more importance than the lessening of this cost and nothing appears which promises to so greatly lessen the cost as the electric vehicle for business purposes. Engineering studies are being made to show graphically these elements of economy and it is expected that this will be one of the important features of the Exposition.

The indications are that the larger trend of this Exposition will differ from other years, in the sense that nothing will be left undone to develop a feeling of patriotism on the part of those attending it, or to suggest possible ways of contributing to the effort to place our country permanently upon a higher plane of economy and efficiency, not only for the better prosecution of the war now upon us, but for greater industrial activity which will last, with continuing and highly beneficent results to our entire country, long after the war has passed into history.

In other words, the Exposition will lend itself in every possible way to the best thought and progress of the day. Should there be at that time any effort, as at the moment, to secure subscriptions to Government funds to prosecute the war, arrangements will be made to take subscriptions for this purpose. Likewise, prominent sections of the Exposition will be placed at the disposal of the Red Cross for subscription and membership effort and for giving a wider degree of publicity to the work of that great organization.

The belief that these efforts will be at least in some degree effective seems justified when remembering that the daily attendance at the show has exceeded that of any other public occasion in New York City, and in reaching a figure in excess of 50,540 in one day's attendance last year, the show has established a record for indoor attendance in any building of this country.

NEW YORK ELECTRICAL SOCIETY HOLDS ANNUAL MEETING.

Secretary's Report Shows Big Gain in Membership and Increased Attendance at Meetings—Election of Officers.

The annual meeting of the New York Electrical Society was held at the Engineering Societies' Building, 29 West 39th Street, New York, June 14. The secretary's report showed that 129 members have been elected during the season, the total membership being now 724. The standard of meetings for which the Society has become so well known, has been maintained during the season and the appreciation of the membership is shown by the fact that the average attendance has been 255, as against 231 of last season.

The following officers were elected:

President, A. S. McAllister.
First vice-president, J. F. Carey.
Second vice-president, Walter Neumuller.
Third vice-president, George H. Barbour.
Treasurer, Thomas F. Honahan.
Secretary, George H. Guy.

NEW OFFICERS OF ILLUMINATING ENGINEERSING SOCIETY.

Announcement of Election of General Officers and Section Officers for 1917-18.

The results of the recent letter ballot on election of national and local officers of the Illuminating Engineering Society were confirmed at the June 14 meeting of its Council and are announced as follows:

General Officers of the Society.—President, George H. Stickney, Harrison, N. J.; vice-president, W. G. Hoyt, New York, N. Y., and C. E. Stephens, Pittsburgh, Pa.; general secretary, Clarence L. Law, New York, N. Y.; treasurer, L. B. Marks, New York, N. Y.; directors R. Ff. Pierce, S. C. Rogers, P. S. Young.

New England Section.—Chairman, S. C. Rogers; secretary, M. R. Pevear; managers, J. W. Cowles, David Crownfield, C. A. B. Halvorson, R. G. Hudson, George P. Smith, Jr.

New York Section.—Chairman, A. S. McAllister; secretary, Norman D. Macdonald; managers, D. F. Atkins, S. B. Burrows, W. J. Clark, Alex. Maxwell, A. L. Powell.

Philadelphia Section.—Chairman, Walton Forstall; secretary, Unit Rasin; managers, John R. Hare, J. B. Kelley, H. H. Ganser, G. B. Regar, C. W. Wardell.

Pittsburgh Section.—Chairman, L. O. Grondahl; secretary, W. P. Hurley; managers, E. J. Edwards, L. J. Kiefer, Harold Kirschberg, J. L. Minick, H. N. Muller.

Chicago Section.—Chairman, E. H. Freeman; secretary, James J. Kirk; managers, C. A. Carpenter, Alfred O. Dicker, A. H. Meyer, Fred A. Rogers, J. L. Stair.

NATIONAL ELECTRICAL CREDIT ASSOCIATION MEETING.

Program for Eighteenth Annual Convention to Be Held at Boston, Mass., June 28 and 29.

The eighteenth annual convention of the National Electrical Credit Association will be held at the Boston City Club, Boston, Mass., June 28 and 29. The following is the program of speakers:

"The Scope of the Electrical Credit Association," by Guy V. Williams, New York City. Discussion led by E. M. Spelman, National Carbon Company, Cleveland.

"Trade Acceptances," by J. D. Meek, Indianapolis Electrical Supply Company. Discussion led by F. S. Hardy, F. S. Hardy & Company, Boston, Mass.

"What and Why is a Cash Discount?" by David Kerr, Lewis Electrical Supply Company, Boston, Mass. Discussion led by L. M. Creighton, Frank H. Stewart Electric Company, Philadelphia, Pa.

"Should Interest Be Charged on Overdue Accounts?" by D. E. Crane, Macbeth-Evans Glass Company, Pittsburgh, Pa. Discussion led by A. E. Case, Western Electric Company, Inc., Boston, Mass.

"The Moral Risk—Definition, Exploitation and Control," by R. P. Tracy, J. E. Greene Company, Boston, Mass. Discussion led by W. W. Harding, Westinghouse Lamp Company, New York City.

"Contractors' Accounting Methods—The Best Credit Barometer," by J. W. Smith, General Electric Company, New York City. Discussion led by T. H. West, Philadelphia Electric Company, Philadelphia, Pa.

"Municipal Mumps—Prevention and Cure." Discussion led by J. S. Thomas, Elliott-Lewis Electrical Company, Philadelphia, Pa.

Norman I. Adams, manager credit department, National Shawmut Bank, will address the meeting on June 28.

Frederic P. Vose, Marquette Building, Chicago, Ill., is secretary of the Association.

COPPER REFINERIES MAY OUTPUT 185,000,000 POUNDS.

Yield Expected to Run to 190,000,000 Pounds a Month—Inefficient Labor and Heat Interruptions to Operations.

It is estimated that the copper refineries of the United States turned out about 185,000,000 pounds of copper during the month of May. This was through maintenance of about the same basis as in April, when the yield was 180,000,000 pounds, and allowing for a three per cent increase on account of the extra day.

There has been no close approach to the December record of 200,000,000 pounds, which was the result of combined efforts of the country's refining plants in the closing month of last year. Refinery yield in the ensuing months has been about as follows, the estimates being those of refinery operators (in pounds):

January	175,000,000
February	160,000,000
March	150,000,000
April	180,000,000
May	185,000,000

New refinery capacity has been gradually completed and much of the expansion program among the various plants has yet to be carried out. Despite the fact that capacity will be somewhat in excess of 200,000,000 pounds monthly it will be largely a "paper" capacity with equipment held in reserve against delays that may occur at other portions of plants. During the past two years there has not been a bit of idle equipment and the result has been that under forced pressure and operation for such a long period there will have to take place considerable replacement work.

In the opinion of some of the refinery officials the country's refined copper yield will range in the future between 180,000,000 and 190,000,000 pounds monthly and upon occasion to possibly 200,000,000 pounds. With the lower estimates fulfilled the refineries will be caring for every pound of raw product that will have been shipped from the mines.

Interruptions to mine operations in the Winter months and reflected by smaller receipts at refineries sixty to ninety days later will be offset in the Summer months by extreme heat at the refineries, making impossible full operations.

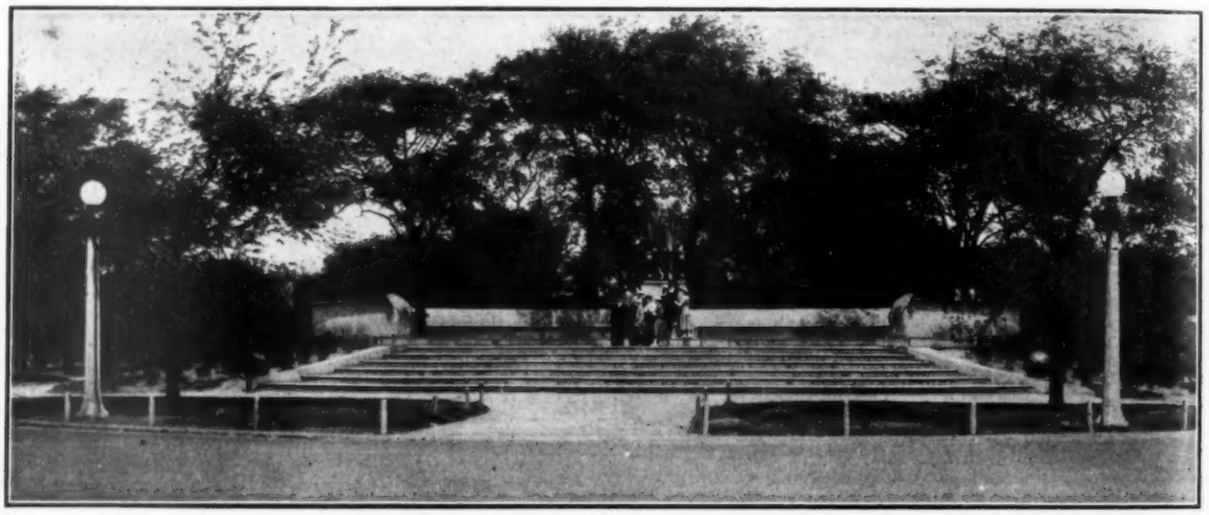
Another factor in keeping down yield from refineries continues to be in the inefficiency of labor. The highest wage scale ever paid, instead of making better workmen, has the opposite effect among the refinery employés and it now takes 30 hours to perform work ordinarily handled in 24.

FLOOD LIGHTING IN PUBLIC PARK PROVES EFFECTIVE.

Night Illumination of Lincoln and Grant Monuments in Lincoln Park, Chicago, and Flood Lighting of Beach Bath House.

Flood lighting has been exploited so extensively in the last year or so that the initiated are apt to regard its adaptability as quite well fixed. However, new possibilities for its use are being developed almost every week as well as new methods of mounting the necessary projector equipment. Excellent examples of these truths are the new installations of flood lighting recently completed in Lincoln Park, the most popular public park in Chicago.

On the evening of June 4, just before national registration day, the flood lighting of the Lincoln and Grant monuments was turned on for the first time. This was an especially fitting time to bring the figures of the nation's great Civil War heroes to the attention of the thousands of visitors to this well known park by night as well as by day. The Lincoln statue at the south end of Lincoln Park is one of the finest sculptures of the famous president. It is impressive not by its size, but by its dignity and faithful reproduction of Lincoln's real characteristics. The accompanying day view of this statue, which represents Lincoln making one of his memorable addresses, shows that the problem of illuminating the statue was a difficult one, because it was out of the question to mount projector lamps on the edge of the large circular stone bench or on special posts placed near it that might easily mar the general effect that was to be brought out in the sculptor's design.



Day View of Lincoln Statue in Lincoln Park, Chicago, Showing Mounting of Pairs of Projectors Near Top of Two Concrete Driveway-Lighting Posts.

A happy solution, however, was found by placing the lamps on the ornamental concrete lighting posts at the edge of the driveway in front of the statue. These posts are of the standard type used throughout the Lincoln Park system and have already been described in our issues of December 25, 1909, and September 20, 1913. The 20-inch single globe is centered about 15 feet above the base. The projectors were mounted in pairs on either side of the post and about a foot below the top globe. Neat and strong iron brackets were bolted about the post and the projectors clamped on these so as to project their light evenly over the front of the bronze statue and its stone base.

The views herewith show that this mounting of the projectors is quite inconspicuous by day, and by night does not appreciably interfere with the normal driveway lighting from the top lamp. The flood illumination of the statue is

very striking and can be seen from a long distance on all the nearby drives and walks. The lamps are about 75 feet from the statue. No attempt was made to light the back of the figure, since the most impressive effect is obtained from the front. Each of the four projectors used is of the Davis type and houses a 1,000-watt gas-filled Mazda lamp. The four projectors are fed from a subway transformer installed in a manhole near the base of one of the posts.

Flood illumination of the Grant monument was also no easy problem. This monument is a composite structure with two walks passing through its granite base at right angles and at different levels. The monument is at the eastern edge of a high driveway and the bronze statue proper is about 40 feet above the level of the lower driveway adjoining on the east. A study of the problem led to placing the projectors directly behind the eight rounded stone caps on the railing around the edge of the roof of the massive granite pergola-like structure forming the main base of the monument. This is made clear from the accompanying night view in which the light beams from four projectors are discernible. The very bright light seen at the extreme right is not from any of the projectors, but from one of the lighting units along the upper driveway. It is evident from this picture that the entire statue with its splendid war horse and upper stone base is brilliantly illuminated on all sides. The bronze statue proper is of very dark bronze, which required a high intensity in the projectors, even though they are placed quite close to the statue. The shadows on the statue relieve the brilliantly lighted surfaces and bring out the true configuration very well.

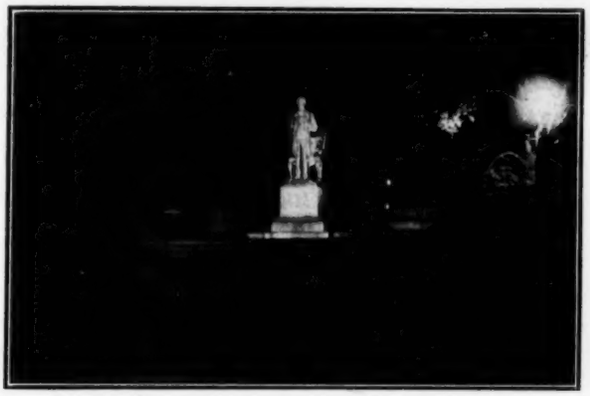
The projectors in this case, eight in number, are each 1,000-watt units. They are fed from a transformer mounted near the base of the statue on the same surface level as the projectors; this transformer is almost entirely hid from view. The transformers are divided evenly on each side of the solid neutral leading from the 220-110-volt three-wire secondary. A locked two-pole switch is connected in the outside wires and this controls the projector group locally. The 2,300-volt primary cable feeding the transformer runs underground from a substation about 2,000 feet from the monument. Another similar cable runs from this substation to the Lincoln statue. These cables are arranged so that they can at any future time be cut into the park's driveway-lighting system.

All the 12 projectors used for the flood lighting of the Lincoln and Grant monuments are of the Davis type and were supplied gratis by the American Lighting Company to further this patriotic illumination project. The statues are lighted all night and are attracting much favorable attention.

Another flood-lighting installation in Lincoln Park that is nearing completion is the illumination of the locker and dressing-room aisles of the bath house at the Diversey bathing beach in the northern part of the park. Formerly these were lighted by means of numerous lamps placed on top of the locker rows. Since all these lockers are in a roofless inclosure and exposed to the action of the weather all the year round, the circuits for these lamps were getting into very poor condition and frequent troubles occurred from grounds and short circuits. The lighting, moreover, was poor. To overcome these difficulties, a battery of 18 General Electric flood-lighting projectors is being mounted on board runways near the edge of the roof of the center building. There are 11 lamps on the men's side and 7 on the women's side. These 18 flood lamps replace about 200 lamps formerly used. They are set so as to project their light along the length of each aisle and it is confidently believed that they will greatly improve the lighting in these portions of this popular bathing establishment.

An article on the flood lighting of this beach proper by means of 18 projectors was published in our issue of July 8, 1916. This proved very satisfactory throughout the bathing season last summer and its success led to the use of flood lamps for lighting the other sections described above.

All of these installations were made by the electrical department of Lincoln Park, of which Claude H. Shepherd is electrical engineer in charge.



Night View of Lincoln Statue Flood-Lighted.

Night View of the Flood-Lighted Grant Monument.

Liberty Loan Day Results in Sale of Nearly $3,000,000 Bonds Among General Electric Employees.

June 12 was "Liberty Loan Day" at the various plants of the General Electric Company and resulted in the sale of $2,955,550 worth of Liberty bonds. The Schenectady Works, with 22,000 employees, the largest plant and the company's main office, led with the surprising total of $1,055,700. A committee of 600 bond salesmen visited every one of the 22,000 General Electric employees at Schenectady and when the last man had subscribed the million dollar mark was passed.

The bond sale at this and the company's other plants was as follows: Schenectady (including general offices), 13,223—$1,055,700. Lynn, 8,598—$557,450. Pittsfield, 4,037—$282,550. Erie, 2,445, $176,900. Edison Lamp Works, 3,175—$211,900. Fort Wayne, 2,125—$151,550. Sprague Electric Works, 802—$57,550. National Lamp Works, 3,910—$253,600. District offices, 1,685—$208,350. Total, $2,955,550.

The company had previously announced that it would purchase bonds to any amount its employees would subscribe and allow them to pay for them on a liberal installment plan. A large number took advantage of this plan to buy bonds. In a number of departments every employee subscribed for a bond. The sale among workmen of foreign extraction was truly astonishing, particularly among the Italian and Polish employees.

Some New Aspects of Electric Cooking

A Compilation of Interesting Statistics Showing the Advantages and Economies of Electric Cooking with a Comment on the Position of the Architect with Reference to Range Sales

By T. H. KETTLE

Minneapolis (Minn.) General Electric Company.

ELECTRIC cooking has been called the gift of genius to the twentieth century housewife, and as the architect bears an indirect relation to the housewife, it is well to study the relation of the architect to the furnishing of such modern conveniences which help to make the home a better place in which to live.

The business, or should we say the profession, of the architect, is a serious, responsible business. An architect is in one sense, a merchant. He gains the knowledge of his profession and then sells it to his clients. In another sense he is a counselor. He must offer his clients sound advice regarding their homes. He must recommend to each one of his clientele plans adapted to their particular requirements and special needs.

The architect, both as a merchant and counselor, is under the heaviest of obligations to advise the installation and use of every service and appliance which will make the home or apartment modern and up-to-date in every respect. Unlike most of the home appliances purchased for the home, the appliances recommended by an architect should last for a lifetime. They must remain serviceable and true to their standard for ten, twenty or thirty years, and at the end of their life must give almost as good service as they did at the beginning.

The architect therefore, who has the proper appreciation of his professional services, will make the matter of knowledge of the various home devices one of his chief concerns. He will inform himself thoroughly concerning the many household helps placed upon the market by the various manufacturers during the last few years. By so doing, he will be able to bring to his aid all his skill, judgment and experience to assure himself of the soundness of the household services he recommends to his clients.

The responsibilities of the architect are particularly heavy for another reason. His client frequently, when planning a new home or apartment, relies absolutely and completely upon his recommendations. The client has neither the time, the money, the knowledge, nor the experience necessary to enable him to determine the value of the various things which go to make a modern home he is building. He is completely in the architect's hands, and the architect of the right sort will not regard lightly the obligations imposed upon him by the relation of trust he bears to his client.

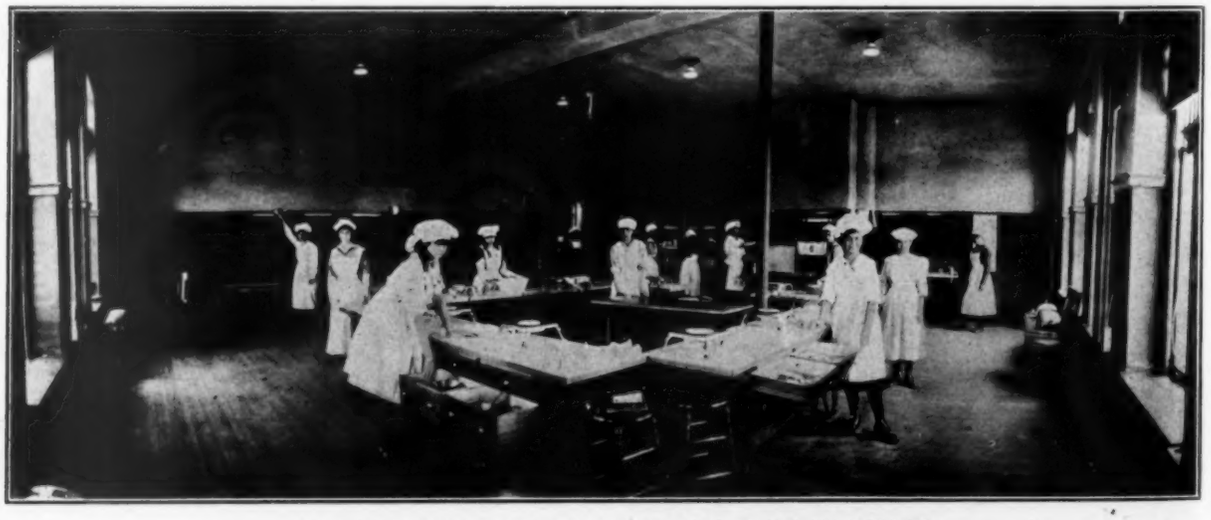
He should be exceedingly careful in the character of the home services he recommends. His clients consult him because they trust him and most of his clients are absolutely dependent upon the services which he advises for the rest of their lives. In other words, the builder of a home is completely in the architect's hands long after the new home has been completed.

This being a fact, and we all know that it is, let us just take one of the more modern appliances for the home aside for a little while, analyze it, and see if we can arrive at some definite relation that exists between it and the architect.

I refer to the electric range, or to be more correct, the electric cooking idea.

It is my opinion that if electric cooking meets the requirements of the average American housewife (and there are now thousands of electric ranges in service all over the country) there is no other method of cooking so well adapted to the needs of the average family.

The more we witness women working in a hot, stuffy kitchen, the more firmly we are convinced that the most vital elements of the housewife's serenity depend upon the use of electric cooking, and we emphasize our conviction that all architects actuated by high minded principles are now in a



An Electric-Cooking Installation in the Havana (Ill.) High School.

The installation of electric-cooking equipment in the domestic-science departments of high schools is an important step in a permanent electric-range campaign. The advertising thus secured is of the greatest benefit in educating the public in electric cooking and in afterwards selling ranges in the homes of the students and their friends. After once using an electric range it is hard to go back to the use of coal, wood, gasoline, etc.

position to render a maximum of efficient, dependable service, as far as the part the kitchen plays in the modern home is concerned.

The more we examine the subject of cooking the more we see that it relates to health, and we all known that health relates to every form of activity of the human race. At one time or another we have all noticed that this world is largely run by people who, while they are not very sick, are not very healthy. Perhaps you have not stopped to think of it in this way, but it is a fact nevertheless, and I believe that the human race (at least as far as women are concerned) may be termed half sick. Quite clearly, something is radically wrong when such a large proportion of people are snatched from us between the forties and fifties when practically any student of health will vouch for the statement that life can be infinitely lengthened, strengthened and made much happier if man only knew how to live and eat right.

Personally, I feel that electric cooking is really a great educational, health producing propaganda—a national religion as it were, making the world better, and capable of its very nature of doing a world of good when its message has been "put across."

I have often thought that the architect really sells the greater proportion of the larger household devices—but perhaps I have used a word wrongfully—perhaps I should have said that the architect makes the greater number of people want to buy what he recommends by reason of his knowledge of the particular thing in question, and the architect can only do this because he can talk on the thing intelligently. But now for a question: Can anyone be of as much assistance in promoting the electric cooking idea as the architect? I think not.

Importance of the Architect in Range Sales.

I claim, therefore, that one of the greatest forces we have, a force with which we can build a greater and bigger and better race, must come from the ranks of the architect. It is he that must handle the presentation of this basic idea of health so that the people will listen and believe and act. Just think of the wonderful health-winning features tied up in the combination of the architect and the central station through the medium of electric cooking.

And this subject of health we have been thinking about is really a very big subject because it relates to every form of human activity and for this reason it cannot be dismissed in a few words, but calls for the constant co-operation of the architect and central station. Hence I say there is a call for a constant propaganda by these two parties.

Let us now look into the electric cooking idea and see just exactly how it really affects the happiness and health of the home.

Advantages of Electric Cooking.

First of all take cleanliness. Did you ever stop to think what cleanliness costs in the modern home or apartment? Take away the sinks, baths, wash basins, towels, and all the other little things and you will get an idea what we pay for cleanliness. Cleanliness costs money, and electric cooking bears the same relation to other forms of cooking that the high class restaurant does to the cheaper restaurant. Clean service costs money and the only way to get it is to pay for it. Another pleasing feature of electric cooking is the fact that pots and pans keep clean and sootless on the bottom, thus eliminating scrubbing and scraping to keep them in a clean condition. This last feature is mentioned merely to show that there is in reality a double saving—a saving in labor in not having to do the cleaning and an actual saving in money in not having to buy or use the cleaning material used in such operations.

Right in line with the above thought on cleanliness we have the sanitary qualities of electric cooking. Any open-flame stove, of any kind, causes a constant reduction in the amount of oxygen in the kitchen and gives off poisonous gases. These escaping products of combustion not only adversely affect the food but also whoever happens to be in the kitchen. I can imagine of no greater injury or injustice that can be heaped upon the housewife than having her cook the daily meals in a kitchen filled with anything but pure healthy air.

J. A. Rawson, kitchen efficiency expert, in a recent article on the kitchen, says:

"A certain statistician has figured that the average length of employment of a cook does not exceed three weeks. The same authority has also found that only one in 20 housewives can honestly say that she enjoys working in the kitchen. Why then do cooks leave home? Why then does the housewife want to come out of the kitchen? Obviously the kitchen must be at fault. A great deal of pleasantness or unpleasantness of the work in the kitchen depends upon the kitchen itself. The thoughtful householder therefore who would keep her cook or make kitchen work pleasant, must start by making the kitchen a pleasant place. This can be accomplished by making it efficient and sanitary and by making it interesting."

Mrs. F. I. Patterson, of the Household Experiment Station of New Jersey, answers these questions very nicely by saying:

"The kitchen stove is surely the one article having the greatest influence over both the family health and family peace, but with the entrance of electricity into the home the possibilities for the future regeneration of housework begin. It may cost more to touch a button, or turn a switch, for the moment, but in the long run, and for returns given, it becomes the most economic medium."

Frankly, I believe the above quotation epitomizes the electric range of today, because it is a story of facts—straight from the shoulder—sane and sound.

Electric Cooking in Minneapolis.

Let us now look at the actual conditions existing in Minneapolis, where there are now 250 electric ranges in service every day, and consider the possible savings from just one or two angles.

Whoever stopped to figure out that for the average woman there are about 950,400 steps in a pair of shoes?

This, then, is what is meant when someone exclaims: "Save your shoe leather," meaning "Save your steps."

Modern housekeeping methods are today saving many steps for the housewife. These methods are not only saving steps which cost money, time and strength, but they are also reducing food wastes, cutting down coal consumption, and by doing away with the dirt and smoke, bringing about a great saving in furniture and housekeeping expenses.

These savings may be comparatively small and inconspicuous in one home, but if they are practiced in a considerable number of homes the totals pile up into startling figures. This is one of the reasons why steady improvements in housekeeping efficiency and saving are steadily bringing about improvements in our living conditions, which many people fail to appreciate. It is these same improvements that, like putting dimes in the savings bank, thrifty, farsighted and economical people take pains to practice.

Who would believe, for example, that enough people in Minneapolis are using the modern method of cooking by electricity so that their saving on meat shrinkage alone may amount to $18,403.30 in one year? Who would believe that this same group of people, by eliminating the use of coal may be saving on that one item alone, $12,750 a year? That they may be saving $600 a year by not having to have their ash cans lugged out to the sidewalk every week; that the total saving in steps for these families amount to 2,263 miles in a

year; and that this saving in steps is just the same as saving for one person out of the group a walk from Minneapolis to the Mexican Border and back?

Savings Effected by Electric Cooking.

These wonderful possibilities in saving figure out as follows:

At the present time there are 250 electric ranges in use in the territory in Minneapolis served by the Minneapolis

The Toy Range Has Led to Many Standard Installations.

General Electric Company. Assuming that the average family includes five persons there are, therefore, 1250 persons in this territory living by the electric way.

The average daily meat consumption per person may safely be assumed at one-half pound, or 625 pounds for the whole group of people. The average shrinkage in preparing meat on the old-fashioned range is 35 1/3 per cent. The average shrinkage in electric cooking is only 10 per cent. This means that the average saving by electric cooking is 25 1/3 per cent, or 144 pounds per day, for this group of people. This, at an average price of 35 cents per pound, equals $50.42 per day, or, if these people use their electric ranges all the year around, an astounding total of $18,403.30 per year.

The average coal consumption per family is one-half ton, or 1000 pounds per month. This equals six tons per year and for 250 families equals 1500 tons (a ton per person per year) at an average price of $8.50 per ton for nut coal, which equals for the year's saving by cutting out the coal, $12,750.

Estimates place the cost of electricity for cooking at $3 per month per family—an average of five in each family. With 1250 persons in this group, and electric cooking assumed for all the year around use, the total expenditure for electric cooking may be figured at $9,000.

Reliable estimates allow 400 pounds of ashes and cinders to the ton of range coal. This large percentage of waste is, of course, due to carelessness in running the fire and to imperfect combustion. In the 1250 tons of coal there are, therefore, 600,000 pounds of ashes and cinders which must be delivered at the curb in can and carted away. The usual charge of ten cents per can of about 100 pounds makes a saving for these people, if they use their electric ranges all the year around of $600 per year.

Think also of the cleaner air everywhere, and the saving from damage of the interior decorations of the home because of the freedom from dust, dirt and soot. Think also of the saving for our municipalities on less ashes to be carted away.

Here's where the saving in steps is figured out:

The 1500 tons of coal which electric cooking eliminates during the year equals 4.1 tons, or 8200 pounds per day. Brought up in scuttlefuls of 25 pounds each, this means a saving for the users of electric cooking in Minneapolis of 328 daily trips to the cellar for coal. If the average cellar stairs have fifteen steps, this is a saving of 4920 steps from climbing cellar stairs, lugging up hods of coal, or 9840 steps in round trips on the stairs. If the average distance from the range down the cellar stairs to the coal bin is 50 feet, or a round trip of 100 feet, electric cooking, therefore, may save 32,800 feet, or 6.2 miles of walking daily. This is equivalent to 2263 miles in a year, or about the same as avoiding the necessity of walking from Minneapolis to the Mexican Border and back.

Assuming that the average woman covers a distance of two feet at each walking step, walks three miles a day and wears out a pair of shoes every four months, in which she has taken 950,400 steps, the possible saving for the group of 250 families equals 4,963,967 steps, or five pairs of shoes.

To sum up these interesting deductions, we have, therefore:

Saving on meat shrinkage per year	$18,403.30
Saving on coal per year	12,750.00
Saving on handling ashes	600.00
	$31,753.30
Cost of electricity, if used all the year around by 250 families for cooking	9,000.00
Saving over coal by this modern method	$22,753.30

Serviceability of Electric Range.

From the above we gather that in the last analysis electric cooking is simply good insurance because it is a medium that will save time, labor, and money.

Let us now apply the modern idea of service to electric cooking. Of course we all know that "service" is a very much overworked word, but let us study this angle of the subject anyway.

The underlying principle of service in electric cooking seems to be that it is more important to teach the housewife how to cook than what to cook. Practically every woman knows what to cook but the factor of most vital importance to the family health is how to cook so that every atom of nutriment shall remain in the food. This is the kind of service that will place electric cooking in the front rank of the national movements because such a propaganda would be a boon to humanity, and a new and deeper conception of our duty to our fellow men.

As a matter of fact the thought of electric cooking itself is founded upon the fundamental idea of catering to the needs, pleasures and well being of all of the people. This is its only justification for existence and the success of any movement to promote electric cooking absolutely depends upon the all important question of service; the best kind of service that can be rendered.

Analyzing the word "service" it is quite possible to build up a foundation for electric cooking that will stand the acid test of actual use and operation.

Satisfaction.

Satisfaction as far as electric cooking goes, means that the electric range must do absolutely the same work as any other means of cooking, at the same ultimate expense—and then some. If it does this then we have talking point number one.

According to Webster's standard dictionary, satisfaction is "That which satisfies or gratifies," and I believe the lesson to be learned here is never to persuade a customer to use electric cooking unless she needs it or should have it. In other words, we should not concentrate on the sale unless the prospect is going to be benefited as much, or as well, as we are. In other words, mutual profit is the only basis on which to sell the electric cooking idea. When this is done, we are selling absolute and permanent satisfaction.

Of course we all know that it takes a lot of real courage to recommend what a woman needs when it is contrary to

what she thinks she wants, but when we know we are right, and she finds out that we are right—that our judgment has brought her satisfaction, she will have confidence in electric cooking, show it to her friends, and no doubt will never miss an opportunity to boost the electric cooking game. This is the kind of satisfaction, I take it, that will sell the housewife because a thorough and satisfactory understanding will always exist between the parties concerned.

As to the satisfaction given by the electric range itself, I am very firm in the belief that the only ranges not giving satisfactory service are those sold contrary to the above policy.

Efficiency.

Cooking scientifically requires accurate control of heat and especially is this true in roasting, where a hot oven is required at first to sear the meat in order to retain the juices, and the meat should be cooked at a lower temperature. When electricity is the fuel this can be done very nicely, but when a coal range is used this is practically impossible and it is also very difficult with any other source of fuel due to the lack of control of the temperature brought about by the varying pressure and the adjustment of the size of the flame.

Guesswork is absolutely eliminated from electric cooking, because the electric range has a much higher efficiency of utilization, due to its scientific construction, and this fact alone makes it possible to secure results with a great degree of uniformity, because the heat is absolutely definite and easily regulated.

But the idea of efficiency has a much broader scope than this in connection with electric cooking.

Efficiency in the kitchen, as in a man's office, means that all the time spent in the kitchen should be productive and no idle time. In other words, any time that is spent in cooking, which is really not necessary, should be charged to the cost of cooking. For instance, if the present form of cooking is inefficient and compels the housewife to spend an hour in the kitchen which she would not otherwise have to spend if the form of cooking was the most efficient, then this hour of time should be charged to the cost of cooking.

Then again, there is a wonderful service that can be rendered the housewife by the proper arrangement of the various kitchen devices. Any service that can be rendered that will lessen the steps of the housewife by the proper placing of the range really has a commercial value, although it is somewhat difficult to place a value on it. But any open minded woman appreciates this kind of service, simply because it does away with wasted time and raises the standard of efficiency of the home.

Recreation.

More recreation is most certainly what every housewife is looking for, and if electric cooking can really give her this then we surely have one grand opportunity with electric cooking. There is absolutely no basting in roasting and once the meat is in the oven it is not necessary to look at it till the meat is cooked. Suppose the average family has two roasts a week, this means that the housewife has to give her undivided attention to the cooking for about three hours per week. With electric cooking this three hours can be used for recreation. From this we see we can save the housewife at least 12 hours per month which most certainly has a commercial value. In addition to this, the saving in time by not having sooty pots to scour and clean is an item worth at least a little consideration in money too. The point to drive home as far as recreation is concerned is that any time electric cooking saves can be devoted to building up the real spirit of the home because it is impossible for a thoroughly exhausted woman to prepare and partake of a dinner and enjoy it like those who are not compelled to spend this time in a hot kitchen. This recreation feature of electric cooking really then is in the nature of a social asset.

Comparison of Reactance and Booster Control for Voltage Regulation of Rotary Converters.

G. A. Juhlin, at a recent meeting of the Institution of Electrical Engineers in London and provincial centers, fully detailed and compared reactance and booster control for voltage regulation. Of the several different schemes devised for this purpose, only these two have found extensive use in England. He said that the limitations of the rotary converter with respect to voltage regulation were generally known as well as the means adopted for obtaining the regulation, but the influence of the different methods on the converter itself, and on the system on which it operated, did not appear to be fully appreciated. With continuous-current generators, voltage regulation can be obtained without difficulties and without additional cost, but owing to the constant conversion ratio of the rotary converter, special means for regulating the voltage are necessary whether the range of voltage is small or large. Small voltage regulations are, however, obtained much more readily, and it is of great advantage to keep the range of voltage within the smallest possible limits compatible with the requirements of the service for which the machine is intended, as the difficulties and cost may be increased to a great extent by a few per cent extra regulation, which may bring the range outside the limit of one system and therefore necessitate the adoption of a more costly arrangement.

Mr. Juhlin said that no general statement as to which system of control was most advantageous could be made, as this must naturally depend on the conditions of the system on which the machines had to operate. In order to bring out the advantages and disadvantages of the respective types a particular case was studied. When dealing with the reactance control, a case was considered where two ranges of voltages were required, namely, 400 to 440 volts for lighting and power and 500 to 550 volts for traction, and as these requirements were fairly common, they were used as a basis for comparison; cost, power-factor and commutation were considered. The author gave the following summary of the two systems as being generally applicable:

	Reactance Type.	Booster Type.
Cost	Cheaper.	—
Power-Factor	Cannot be controlled at will for each voltage and load.	Can be controlled at will for any load and voltage.
Commutation	Good commutation is more readily obtained.	—
Range of voltage.	Limited (± 7½ per cent may be considered as the limit).	Great range can be obtained (± 15 per cent or more).
Efficiency	Slightly higher.	—
Starting	No difference.	No difference.
Space	Less space required.	—
Maintenance	—	More parts to keep in order.

Mr. Juhlin's conclusions showed that the question of voltage regulation of rotary converters was one which required close consideration from every point of view in order to obtain the best results as regards first cost and operation. The simplicity of the reactance control, coupled with its low cost and advantages in operation, were factors which recommended it very strongly wherever the range of voltages required permitted its adoption, even at a sacrifice in way of power-factor, and he emphasized the fact that although the power-factor might be slightly lagging at the high-tension side of the transformer the general power-factor of the system might be improved.

Cost of Operating Arc Lamps Shown.—The city lighting commission, Norristown, Pa., operating the municipal electric lighting plant has issued a statement showing that the average cost of operating the street arcs during the past year has been $38.84 per lamp. About 230 arc lights are now installed and 75 tungsten lights.

Testing Primary Watt-Hour Meters

An Outline of the Principal Tests and Adjustments of Three-Phase High-Tension Watt-Hour Meters Used for Important Prower-Transmission Circuits

By K. H. BAUSMAN

Dayton Power & Light Company, Dayton, Ohio.

WATT-HOUR meters that are installed with either potential or current transformers, or both, must be correctly calibrated with respect to the energy in the primary or high-tension circuit, and the purpose of this article is to describe methods of testing primary watt-hour meters so that a high degree of accuracy is attained.

Instrument Transformers.

Properly designed potential and current transformers are very suitable for measurements of high accuracy, but both have inherent errors of more or less magnitude due to variations of both voltage and current in the primary circuit, and the nature and amount of secondary load.

Potential transformers are operated at practically constant voltage and are not subjected to ratio errors due to low voltage, but both the ratio and phase angle (i. e., the deviation from opposition of the primary and secondary voltage) depend on the amount and character of the secondary load. From this it will be seen that with a fixed secondary load, such as the potential coils of a watt-hour meter, the ratio and phase angle will be constant.

With current transformers, however, a different condition exists. The ratio and phase angle depend on the amount and character of the secondary load, and also on the amount of current in the primary winding. The secondary connected load will be constant and consists of the current coils of the watt-hour meter, relay, and probably an ammeter, but the current in the primary will vary through wide limits, and thus cause a variation in the ratio and especially the phase angle.

The permanency of commercial transformers is such that their ratios may be considered unchanged for a period of five years, but not longer without recalibration, provided that the secondary of the current transformer has not been opened under load or the instrument subjected to continuous overloads or primary short circuits.

When the secondary of a current transformer is opened under load, the ratio and phase angle are changed because the iron is not left in a neutral magnetic condition, and the instrument draws a higher magnetizing current.

Both the ratio and the phase-angle error affect the registration of a watt-hour meter; the ratio error affects the meter at all power-factors, while the phase angle appreciably affects the meter on low power-factors only.

When a meter is installed with current and potential transformers, the phase angles of these instruments tend to neutralize each other under ordinary load conditions; there-

THE DAYTON POWER & LIGHT CO.

METER TEST DATA CO. No

NAME ____ DATE ____

MAKER'S No. ____ AMP ____ VOLTS ____ INDEX K ____

DISK K ____ G. K ____ G. R ____ TEST K ____

TEST STANDARDS DATA

METER A No. ____ C. T. No. ____ AMP ____ P. T. No. ____

METER B No. ____ C. T. No. ____ AMP ____ P. T. No. ____

PRIMARY 3 PHASE TEST AS FOUND

METER REV	STD. REV A	STD. REV B	S. WHRS A	S. WHRS B	S. PH. WHRS.	PRI. 3 PH. WHRS.	TRUE PRI. 3 PH. WHRS.	METER PRI. WHRS.	ACC.

PRIMARY P. F. ____ METER A P. F. ____ METER B P. F. ____

SEC. ACC. A = ____

SEC. ACC. B = ____ = TAN ϕ TAN δ X 100

TAN ϕ = ____ A = ____ T = ____

TAN ϕ TAN δ X 100 = ____

PRIMARY 3 PHASE TEST AS LEFT

METER REV	STD. REV A	STD. REV B	S. WHRS A	S. WHRS B	S. PH. WHRS.	PRI. 3 PH. WHRS.	TRUE PRI. WHRS.	METER PRI. WHRS	ACC.

PRIMARY P. F. ____ METER A. P. F. ____ METER B P. F. ____

SEC. ACC. A = ____

SEC. ACC. B = ____ = TAN ϕ TAN δ X 100

TAN ϕ = ____ A = ____ T = ____

TAN ϕ TAN δ X 100 = ____

SECONDARY 3 PHASE TEST AS LEFT

METER REV.	S. REV A	S. REV B	S. WHRS A	S. WHRS B	P. S. PH. S. WHRS.	P. S. PH. M. WHRS.	ACC.	P. T. & C. T. ERROR

Blank Log Sheet for Recording Meter Test Data.

RESULT OF TEST AS A AMP. VOLT METER

TOP ELEMENT

M. REV.	S. REV.	S. WHRS.	M. WHRS.	ACC.	
					AS FOUND P. F. 1.00
					AS LEFT P. F. 1.00
					AS FOUND P. F. .50
					AS LEFT P. F. .50

BOTTOM ELEMENT

M. REV.	S. REV.	S. WHRS.	M. WHRS.	ACC.	
					AS FOUND P. F. 1.00
					AS LEFT P. F. 1.00
					AS FOUND P. F. .50
					AS LEFT P. F. .50

CURRENT COILS IN SERIES

M. REV.	S. REV.	S. WHRS	M. WHRS.	ACC.	
					FULL LOAD
					AS LEFT

TOP ELEMENT LIGHT LOAD

					AS LEFT

BOTTOM ELEMENT LIGHT LOAD

					AS LEFT

FINAL CHECK CURRENT COILS IN SERIES

M. REV.	S. REV.	S. WHRS	M. WHRS.	ACC.	

Blank Log Sheet for Recording Results of Meter Test.

fore the phase-angle error will not be as great as when either current or voltage transformers alone are used.

Since the ratio and phase-angle error affect the watt-hour meter, care should be taken to select current transformers of proper size and design, and not overload them with instruments.

Formerly, when an instrument transformer had a nominal ratio of, say, 20:1, this ratio was assumed to be correct throughout the life of the transformer, regardless of its use or abuse; but now there are commercial methods of testing transformers for ratio and phase angle which can be used in most central-station laboratories.

Methods of testing potential and current transformers are given in "Scientific Papers of the Bureau of Standards," Nos. 217 and 233.

Testing Three-phase, Three-wire, 2200 and 6600-volt Watt-hour Meters.

The testing equipment consists, principally, of two portable standard current transformers, two portable standard potential transformers, two single-phase rotating standards termed *A* and *B* standards, flexible current leads with special lugs or clamps to facilitate making the proper connections, high-tension potential leads with clips, together with the secondary wiring and three-point potential switch.

The standard current transformers are connected directly in series with the primary circuit by means of special lugs, the connection being made at the most accessible place, usually at the disconnecting switches, oil-switch terminals or current-transformer lugs.

The standard potential transformers are connected to the primary lines in open delta, using the primary leads and clips.

The secondaries of the transformers are properly connected to the rotating standards.

A check is then taken, using a three-point switch to simultaneously close and open the potential circuits of the standards.

A permanent record is kept of the following:

Revolutions of watt-hour meter under test.

Revolutions of standard *A*; i. e., the standard in the "high" phase.

Revolutions of standard *B*; i. e., the standard in the "low" phase.

Watt-hours of standard *A*; i. e., the disk constant multiplied by the revolutions of *A*.

Watt-hours of standard *B*; i. e., the disk constant multiplied by the revolutions of *B*.

Three-phase watt-hours; i. e., whether additive or subtractive.

The primary three-phase standard watt-hours; i. e., three-phase watt-hours multiplied by the nominal ratio of transformation of the standard potential and current transformers.

The true primary three-phase standard watt-hours.

The meter primary three-phase watt-hours; i. e., the disk constant of the meter multiplied by the number of its revolutions.

The true primary three-phase watt-hours are computed as follows: When the meter under test is checked for a certain number of revolutions, a simultaneous stop-watch check is taken; from this the kilowatt demand is obtained. From the ratio of the revolutions of the *A* and *B* meters, the primary power-factor is computed; also the secondary power-factor of standard *A* and *B*.

It may be well to mention here that the secondary load and its power-factor should be clearly distinguished from the load and power-factor in the primary or high-tension circuit: also that the *A* standard is always connected so that it has the higher power-factor.

At unity power-factor in the primary the *A* meter will operate at 86 per cent power-factor, current leading, and the *B* meter will operate at 86 per cent power-factor, current lagging.

At 86 per cent power-factor in the primary, lagging current, the *A* meter will operate at unity power-factor, current and voltage in phase, and the *B* meter will operate at 50 per cent power-factor, current lagging.

At 50 per cent power-factor in the primary, lagging current, the *A* meter will operate at 86 per cent power-factor, current lagging, and the *B* meter will operate at 0 power-factor, current and voltage at quadrature.

Thus it will be seen that under ordinary load conditions, i. e., lagging current and power-factor between 50 and 100 per cent, the error introduced on the *A* standard, and also the *A* element of the watt-hour meter will be in ratio only, while the error on the *B* standard and also the *B* element of the watt-hour meter will be both in ratio and phase angle.

The secondary accuracy of the *A* standard equals

$$\frac{\text{true ratio of current transformer}}{\text{nominal ratio of current transformer}} \times \frac{\text{true ratio of potential transformer}}{\text{nominal ratio of potential transformer}}$$

The secondary accuracy of the *B* standard equals

$$\frac{\text{true ratio of current transformer}}{\text{nominal ratio of current transformer}} \times \frac{\text{true ratio of potential transformer}}{\text{nominal ratio of potential transformer}} - \tan\phi \tan\delta \times 100,$$

where ϕ = phase displacement between secondary current and secondary voltage; that is

cos ϕ = secondary power-factor, which has been determined as shown before.

δ = resultant phase displacement introduced by the two transformers, and ordinarily equals

where β = phase angle of secondary current with respect to primary current.

γ = phase angle of secondary voltage with respect to primary voltage.

Usually, ϕ is lagging, β and γ leading and β larger than γ, so that the correction is subtractive, as shown above.

If the watt-hour meter is operating on a very low primary power-factor, it then becomes necessary to correct the *A* standard for phase-angle error, applying the same correction formula used for standard *B*.

If the true ratio of the transformers is less than the nominal ratio, the true primary watt-hours will be less than the nominal primary watt-hours; i. e., the ratio correction will be subtractive. If the true ratio is greater than the nominal, then the true primary watt-hours will be greater than the nominal primary watt-hours; i. e., the ratio correction will be additive.

From the primary meter watt-hours, and the corrected standard primary watt-hours, the "primary three-phase as found" accuracy is obtained.

Tests and Adjustments.

This test is made without disturbing any of the meter wiring, not even removing the meter cover, and gives the true accuracy of the watt-hour meter under true load conditions.

The meter is then entirely disconnected from the instrument transformers, taking extreme care that the secondaries of the current transformers are short-circuited, and is tested as a five-ampere, 110 volt meter as follows;

In almost every case either 110 or 220 volts is available near the location of the meter and this is used in this test. A small rheostat that can be used on either 110 or 220 volts is used for load.

The top element is tested "as found" at unity power-factor on 100 per cent and 10 per cent load with both potential coils excited and on 100 per cent load at 50 per cent power-factor current lagging.

The jewel and pivot are changed and the meter cleaned if necessary.

Then the elements are balanced.

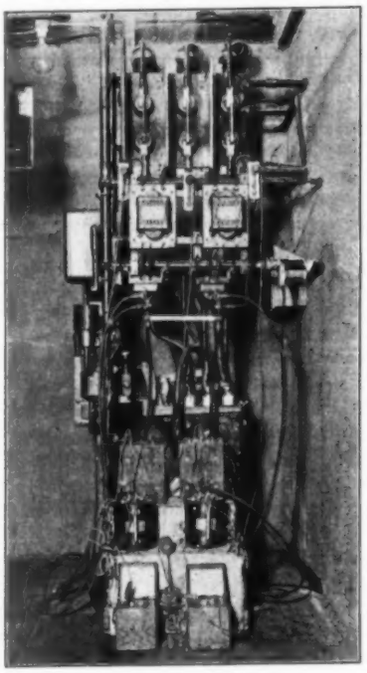
Next, the top element is adjusted to 100 per cent accuracy on full load at unity power-factor, and the same test is applied to the bottom element.

Then each element is corrected on full load at 50 per cent power-factor; i. e., relagged, if necessary.

The current coils are connected in series and the potential coils in parallel and full-load calibration is made at unity power-factor.

This test gives the interference between the elements.

Next, with the top potential coil excited, this element is



Arrangement of Apparatus for Testing Primary Meters.

corrected on 10 per cent load at unity power-factor, and the same test is applied to the lower element.

This test balances the light-load adjustments.

The final check is made with the current coils in series and the potential coils in parallel on 100 per cent and 10 per cent load at unity power-factor, adjusting, if necessary, to give 100 per cent accuracy.

In making the above tests at unity power-factor, if 110 volts from a power or lighting transformer is not available, then potential is taken off the secondary of one standard potential transformer, taking care to connect the primary to the same phase that the transformer supplying the load current is connected.

In order to make the 50 per cent power-factor test the phase rotation of the system should be determined. This may be done by finding the "high" element of the watt-hour meter before it is disconnected, and tracing the wiring to find which potential transformer is connected to the "high" phase.

The phase rotation will then be "high"—"low"—"middle."

By means of a vector diagram giving these phase relations, connections for 50 per cent power-factor can be made that gives lagging current and thus time will be saved in relagging the meter. In fact, in order to calculate the accuracy of a watt-hour meter when tested on power-factor other than unity, it is necessary to know whether the current is leading or lagging, because leading current makes the lag error in one direction, and lagging current in the other direction.

The watt-hour meter and the standards are then properly reconnected to their respective instrument transformers and the "primary three-phase test as left" is made.

The same method is followed as when the "primary as found" check was made, except in this test the meter is adjusted, if necessary.

The correction may be made in the following manner:

Since the element of the meter measuring the greater amount of power (i. e., the high element) operates close to unity power-factor, the error introduced on this element by the instrument transformers will be in ratio only, and is compensated by means of the magnets.

This test is made by disconnecting the current transformer secondary from the low element and using the *A* standard only.

The element measuring the lesser amount of energy (i. e., the low element) operates at a low power-factor, and is therefore affected by both ratio and phase-angle error.

The ratio error has been compensated by the adjustment made on the other element. (This assumes that the elements are balanced and that the ratios of the transformers are nearly equal.)

The effect of the phase-angle error is equivalent to a certain error in the lag adjustment, and may be compensated by relagging this element.

This test is made with the high-element current transformer disconnected, and using the *B* standard only. This method is mentioned as a possibility.

We find in actual practice that, if a meter is correct at 50 per cent power-factor, an over-all connection may be made with the magnets alone without introducing an appreciable error.

The standards *A* and *B*, however, are corrected for both ratio and phase-angle error, using the correction curves and formulas.

The phase-angle error appreciably affects the low element only, and this error increases as the load and power-factor decrease. The low element registers the lesser amount of power and its registration decreases as the power-factor decreases; therefore it will be seen that the phase-angle error, while it may amount to several per cent or even more does not introduce a very appreciable error on the total registration of the meter.

After the meter has been calibrated to true primary energy, the testing equipment is disconnected and the "secondary three-phase test as left" is made.

The current coils of the standards *A* and *B* are connected in series with the current coils of the high and low element, respectively, and the potential coils are connected to the secondaries of the potential transformers, taking extreme care to make the proper connections.

A three-phase check is taken, using the nominal transformation ratio of the current and potential transformers. The difference between the accuracy of the meter in this secondary test and the accuracy of the meter in the "primary three-phase test as left" is the over-all error of the instrument transformers, and this correction may be used in making future tests.

On 1100 and 2200-volt circuits of not more than 80 amperes, we sometimes insert the standard meters directly in the primary. This eliminates the current-transformer error on the standards, and is occasionally advisable; however, testing in this manner requires that the potential and current coils of each standard be connected so as to eliminate voltage stress necessitating the use of rubber gloves for the operation of the potential switches, and a very careful placing of all leads.

When testing single-phase meters installed with instrument transformers, either the above or the following method is used.

The testing equipment consists of a standard potential

and current transformer, rotating standard, phantom load, and necessary leads.

The current transformer is connected in series with the line; the potential transformer is connected to the primary line, and the standard meter is connected to the secondaries.

The test is made very similar to the "three-phase primary test as found," using the correction formula given above.

The meter is then disconnected and tested as a five-ampere meter in exactly the same manner as each element of a three-phase meter.

The current transformers are next entirely disconnected from the primary, and the phantom load connected to them, the secondaries of the transformers having been reconnected to the meters. By using the phantom load, a unity power-factor is obtained for ratio correction.

The meter is then corrected to 100 per cent accuracy by means of the magnets, using the ratio correction on the standard meter.

After this is done, the current transformers are reconnected to the line, and a "primary check" is taken. If the power-factor of the primary load is less than unity and the meter shows any inaccuracy, this inaccuracy is corrected by relagging. This last error is the phase-angle error of the instrument transformers.

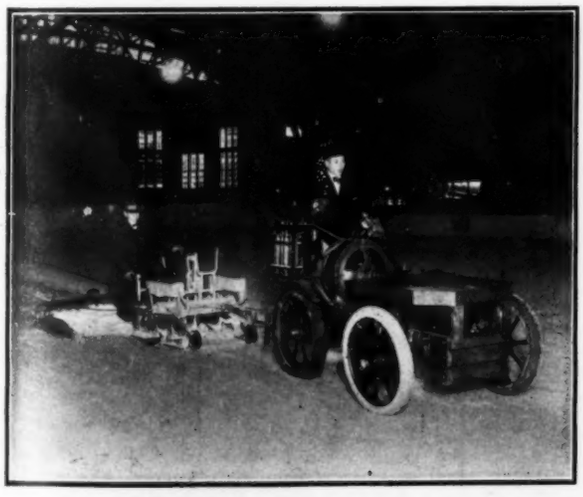
If a secondary check is taken, the over-all error may be computed and used in future tests.

Motor-Driven Scraper for Ice-skating Rinks.

A new and rather interesting application of electric motors is shown in the accompanying illustration. This consists of an electrically driven ice scraper for use in the large number of ice skating rinks which have been built in the past year and is the invention of Dudley H. Scott, Cleveland, Ohio.

Condition of the ice sheet is obviously a matter of prime importance to the skaters and hence to the management of the rink.

In the construction of the rink, the brine pipes are laid just above the bottom of a shallow tank. White sand is then filled in around and for a small distance above them.



Motor-Driven Scraper for Ice Rinks.

This is then saturated with water and frozen. Over the top of the mass water is then sprayed and frozen in successive layers until a sheet of ice several inches thick is formed. The surface is then scraped and a final flooding and freezing is given, when it is ready for the skaters.

At the opening of the session the temperature of the room is allowed to rise sufficiently to melt a thin film of water on the ice surface. By controlling the temperature of the room through the use of gas fires on cold days and the air-cooling room on warm days and by controlling the temperature of the brine, it is possible to keep the surface of the ice at a temperature just low enough so as not to become slushy and high enough not to become brittle. As soon as the session is over the ice is scraped deeply enough to remove all cuts made by the skaters. The snow removed is then dumped into a melting tank, and what small amount remains is taken up by rubber squeegees pushed by men on skates. Water is then sprayed on to cover the surface completely and then frozen before the next session opens. By this careful process the ice surface is always clean and free from cracks, and chipping during the session is at a minimum.

For scraping the ice the scraper, as shown, was invented by Mr. Scott. This was made by mounting a 10-horsepower motor on a small automobile chassis. A Ford chassis was first used.

The idea of running the outfit by a slip-ring induction motor was to secure a very slow and variable speed, the 10-horsepower motor and control being mounted on the chassis, connection being made to the transmission shaft of the chassis by a chain. The tractor draws a trailer which carries a planning blade adjustable as to the depth of the cut. A maximum speed of 10 miles per hour can be made. Power for the planer is secured through a cable suspended from the center of the roof. The cable is made to revolve as the tractor is driven around the rink by the motor, which can be started, stopped or reversed from the seat of the tractor. This prevents twitching of the cable. The cable drags on the ice, but with no interference with the management of the planer except in the last two or three trips up and down the center of the ice surface.

The scraper shown in the illustration is equipped with a Lincoln motor. An Allen-Bradley controller is used to vary the speed of the motor.

Western Union to Have New Building in Chicago.

To accommodate its rapid increase in business the Western Union Telegraph Company is planning to erect a new building for its purposes in Chicago. It will be located on La Salle Street, just south of Van Buren Street. A lot 300 feet by 101 feet has been purchased for $594,000. The building will house the company's general offices and all of its operating departments. It will have two basements and at first six stories above ground. The foundations, however, will be ample to provide for a 15-story structure. The cost of the building will be about $1,000,000.

In addition to every possible mechanical and electrical contrivance to facilitate the business of the company, elaborate plans are contemplated for the purpose of contributing to the health and convenience of its 4000 employees in Chicago. There will be large rest and recreation rooms, lecture hall, gymnasium and showers.

The present Chicago quarters of the company in the Western Union Building, at Clark Street and Jackson Boulevard, are inadequate, even though additional room is occupied in adjoining structures.

The statement has been made that Chicago is the greatest wire center in the world and that the telegraphic traffic of the city has more than doubled in three years. The company expects to occupy its proposed new home in about 18 months.

Chicago Telephone Employees Heavy Subscribers to Liberty Bonds.—Up to noon, Thursday (June 14th), the employees of the Central Group of Bell Telephone Companies had subscribed for Liberty bonds to the extent of $652,850. The total will probably reach $700,000. The Chicago Telephone Company's employees subscribed for $370,250 of the bonds. Of these subscriptions 5,891 were for the $50 denomination, indicating that the demand was largely from small investors.

Ball Bearings for Electric Motors

A Brief Discussion of the Many Advantages Resulting from the Use of Ball Bearings for Electric Motors and Generators, Especially Where Subjected to Very Severe Operating Conditions

By H. N. TRUMBULL

INDUSTRIAL operations are carried on for profit, and profit depends upon the difference between selling price and cost. This difference, due to the events of the past few years, has been steadily decreasing—especially in the manufacture of electrical machinery. For, on the one hand, the cost of all raw materials has been advancing, as has also the cost of labor and the expense of marketing the product; on the other hand, the manufacturers of electrical machinery, because of keen competition in this line, have not deemed it expedient to advance their selling prices in proportion to the increasing costs. The service rendered by electrical machinery produced by the various manufacturers is so nearly identical that no one company has considered it wise to take the initiative in marked advance of selling price. Such conditions might soon prove disastrous and so each manufacturer has been endeavoring to incorporate in his design some material improvement which will net the customer a present and ultimate economy and induce him to pay an increased first cost.

Almost simultaneously many of the manufacturers have answered this question by incorporating ball bearings in the design of their standard equipment. No other single improvement has been made in the last five years which has increased the ruggedness and economy of motors as much as ball bearings. This improvement has proven to be a sales advantage and ball-bearing equipment, because of its strong sales appeal, puts motor selling on a more profitable plane.

For a number of years the desirability of using ball bearings on electrical machinery has been the subject of discussion by engineering societies both in this country and in Europe, but now this question has been taken out of the realm of discussion and made a cold dollars-and-cents proposition.

Not only has the incorporation of ball bearings in motors and generators lessened the selling expense for the manufacturer and allowed him to charge a higher price, but it has also offered such economies to the user of these machines that the higher initial cost has been much over-balanced and additional profits made possible. In fact, progressive mill owners, mine superintendents and shop managers all over the country, who are facing the same problems of advanced costs of materials and labor, are forced to introduce better machinery and to grasp every opportunity for completing a manufacturing operation in less time and at a decreased expense, and so they are specifying ball-bearing equipment.

In order to obtain an idea of the advantages of the application of ball bearings to electrical machinery, a series of questions was recently submitted to motor-manufacturing engineers and users of ball bearings throughout the country. A careful analysis of the replies, giving the tests and experience of motor designers and users shows the following advantages in favor of ball bearings.

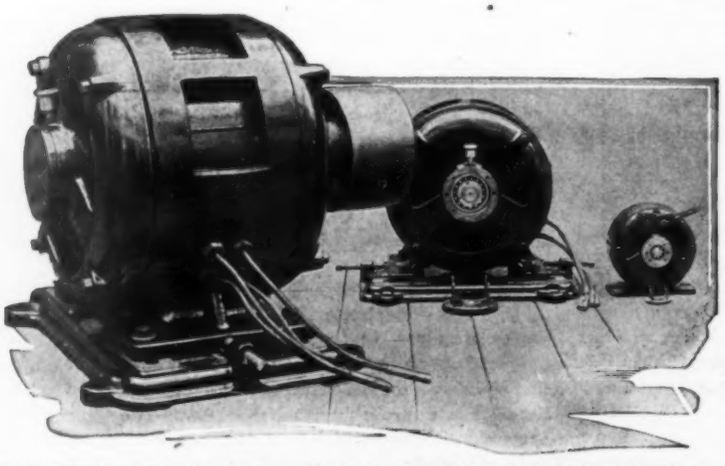
Maintained Air Gap.

Among the principal advantages of ball bearings on motors are their precision and freedom from wear. The bearing adjustment remaining constant keeps the rotor in the center of the magnetic field. This permits the motor manufacturer to employ air gaps with clearances so slight that they could not be considered on motors having any other type of bearing. On induction motors a close air gap is of vital importance in the improvement of the machine efficiency and the power-factor.

Chief among the difficulties with plain bearings is the fact that after a period of service the bearings wear down to an amount varying with the load and service conditions. If this wear continues, it will finally permit the armature to touch the pole pieces with resulting trouble—perhaps a stripped armature.

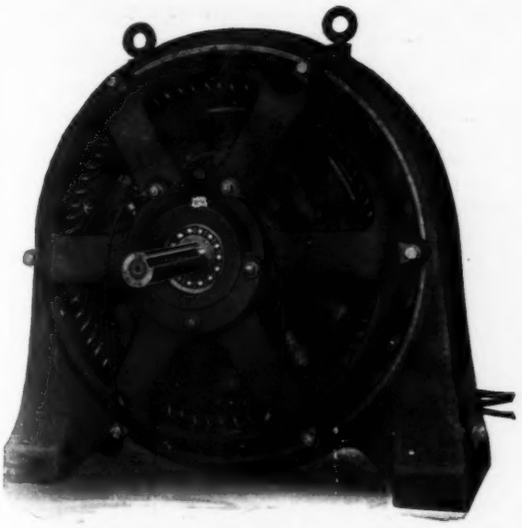
In a ball bearing, hardened steel balls roll on hardened steel bearing races, thus rubbing friction is practically eliminated and accuracy is maintained.

On axle-driven generators used for railway car lighting, the bearings must maintain the air gap or a stripped armature results. Ball bearings have replaced plain bearings for this service almost entirely because of the greater dependability attained. Records of 200,000 car-miles, where ball bearings are used, have become common, in spite of the frequently ex-



Ball Bearing Induction Motors Made by the Robbins & Myers Company. The End Caps of the Two Right-Hand Motors Are Removed, Showing the Bearings.

Type "K" Steel-Frame Adjustable-Speed Interpole Motor for Operating Steering Gear on Submarines. Manufactured by Diehl Manufacturing Co.



A 60-Cycle, 2300-Volt Synchronous Fairbanks-Morse Motor Equipped With Ball Bearings.

A 24-Volt, 40-Ampere, Vehicle-Type Motor. Manufactured by the Diehl Manufacturing Company.

cessive tension of the belt. The shock and distorting action on the shaft due to crossovers, switch frogs and uneven track, the snap of the generator belt when flying ballast is picked up and passes between the belt and pulley, all deflect the armature shaft. It is found that self-alining ball bearings accept these shaft deflections without binding or wear.

Improved Commutation.

On direct-current machines, the fact that ball-bearing heads are sealed so as to prevent the escape of lubricant keeps the commutator clean. Commutators are thus protected against a conducting "slop" of dust and oil and good commutation is maintained.

Precision and durability of bearing setting also insures better commutation.

Freedom from sparks from the commutator in flour mills, in coal mines, in textile mills, in woodworking plants, or wherever there is combustible dust, reduces the possible danger of ignition or explosion, thereby materially decreasing the fire and accident hazard.

Comparative Efficiency.

On motors in which the shaft is subject principally to rotating action (torque), bearing friction is a very small percentage of the motor losses. This is the case in direct-coupled units, centrifugal pumps, motor-generator sets, etc. The bearings carry but little, if anything, in excess of the weight of the rotor; therefore pressure between shaft and bearing lining is inconsiderable and bearing friction is a minimum.

Where the motor shaft is subject to bending action, however, bearing friction becomes an important consideration. This is the case with belt and gear-drive motors. The bearings are subject to severe bending, pounding or shock strains, especially at the driving end. Ball bearings in these cases show a decided saving over plain bearings. This is due to the fact that in ball bearings the friction is practically constant over a wide range of pressures, and because rolling is substituted for the rubbing action of plain bearings.

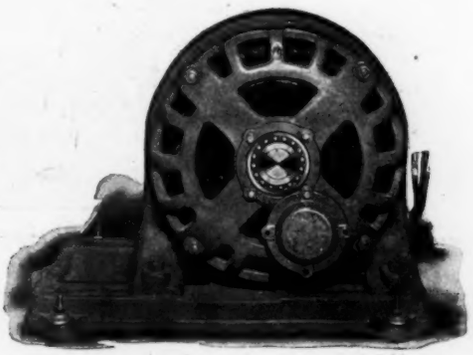
Compactness.

Compactness is required in conditions usually found in general industrial applications for induction and direct-current motors. To get this feature of compactness, motor manufacturers develop the greatest possible horsepower from a given size of motor frame. This reduced size per horsepower capacity gives the greatest driving power in limited space conditions.

The length of the motor bearings affects the question of compactness to an important degree.

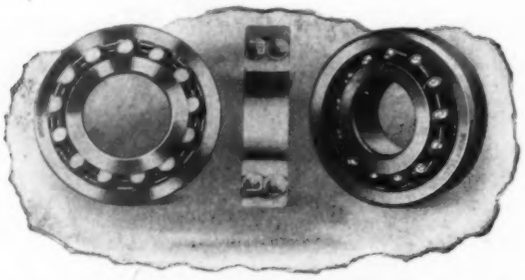
Babbitt bearings are usually designed with the box length two and one-half to three times the diameter of the shaft which they support. Contrasted with this, the length of ball bearings along the shaft usually is not over one-third of the shaft diameter. Surrounding the ball bearing is the lubricating chamber, which at its outside limits is one-half to one-third shorter along the shaft than the plain bearing for the

Charging Motor Generator for Storage-Battery Work. Manufactured by the Electric Products Company. Equipped With Ball Bearings.



A 20-Horsepower Induction Motor Manufactured by the Fairbanks-Morse Company With Bearing Cap Removed Showing Ball Bearing.

same motor, with the result that the over-all length of motors can be reduced 10 to 27 per cent by the employment of ball bearings.



S K F Radial Ball Bearing Shown in Normal Position, in Cross-Section and in Deflected Position.

Where a consideration of aisle room, floor space, machine arrangement, etc., is necessary, a ball-bearing motor goes a long way towards solving the problem, as shown in the following table:

PLAIN DIRECT-CURRENT MOTORS.

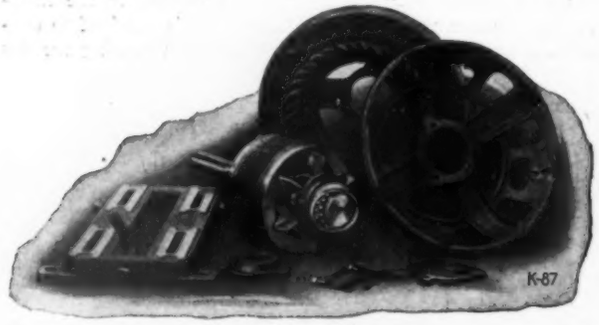
Size of Motor.	Motor Length Over All—Sleeve-bearing Motor. Inches.	Ball-bearing Motor. Inches.	Reduction in Length. Per Cent.
5	26¼	23	12
6	26⅞	24¼	9.8
7	31 11/16	26	18
8	35½	29¾	16.2
9	38⅞	32⅛	17.4
10	41 9/16	34¼	17.6
11	45⅞	37 7/16	18.4
12	49⅞	38¾	22.4

INTERPOLE MOTORS.

Frame Size.	Motor Length Over All—Ring-oiler Bearing Motor. Inches.	Ball-bearing Motor. Inches.	Reduction in Length. Per Cent.
½	18⅞	16¼	13.9
1	20 15/16	18	14
2	23 7/16	19 7/16	17
3	25⅛	19⅝	21.8
5	28⅛	22⅛	21.2
7½	33	25 9/16	22.6
10	37	28¾	22.3
15	43⅛	33¼	22.9
20	45½	33 3/16	27.1
25	45⅝	37¾	17.3
30	51⅜	38 1/16	26
40	53 3/16	41⅜	22.2
50	57⅛	42 13/16	25

SIMPLICITY AND CLEANLINESS.

The use of ball bearings reduces the head construction to its simplest terms. Instead of oil rings, chains, wicks, waste packing or other devices which are required for plain-



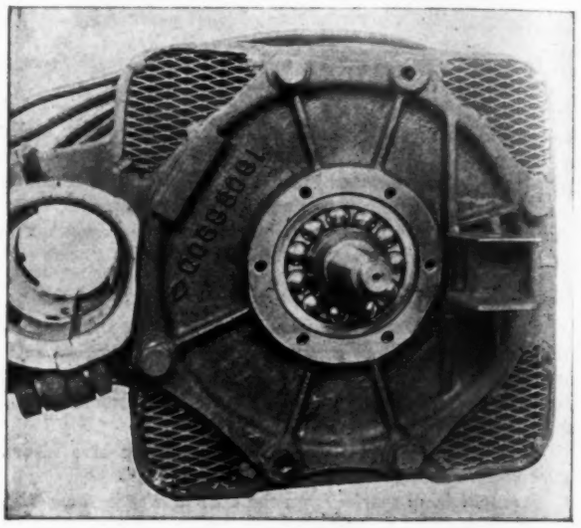
Disassembled View of Fairbanks-Morse Motor, Showing Ball Bearings.

bearing motors, ball bearings require no oiling devices other than the ball bearing itself. Ball bearings are in themselves positive self-lubricators. Instead of necessitating frequent inspection of the bearings, renewal of the lubricant and possibly occasional rebabbitting, ball-bearing motors require no attention other than periodic lubrication—the length of time between inspections being from one week to six months, depending upon the service.

Ball-bearing motors are clean. The ball bearings are encased within bearing heads with sealing grooves on each side of the bearing, preventing the leakage of lubricant. With this protection, dripping or leaking of oil is eliminated and there is no danger of goods becoming soiled or contaminated with oil from this source.

GEAR-DRIVE MOTORS.

Where gear drive is used, ball bearings on electric motors are of particular advantage. In order that gears shall run smoothly and quietly, the proper distance between pinion and gear centers must be maintained. It is a fact that noisy, chattering gears may be caused by wear having taken place in the bearings supporting the gears. After long service with this type of drive, ball bearings show no appreciable wear and consequently the gears mesh properly, giving longer and better service.



Railway-Type Motor Manufactured by the General Electric Company. Bearing Cap Removed, Showing Ball Bearings.

Plain bearings must be designed so that the pressures are well under the limit for the corresponding speed of the bearing. To reduce unit pressure in the bearing surfaces, it is necessary to increase the rubbing area. This may be done in either of two ways:

First, by increasing the journal length. This, of course, offers the disadvantage of increased floor space required by the motor, and where compactness is a desirable feature this is a serious handicap.

Second, by increasing the shaft diameter. Increasing the diameter increases in direct ratio the speed of the rubbing surfaces which should be kept as low as possible, because each increase of rubbing speed directly increases the likelihood of hot bearings. Larger shafts also mean heavier and more costly motors.

Whether, therefore, the bearing length or the shaft diameter be increased, the plain bearing is confronted with positive limitations.

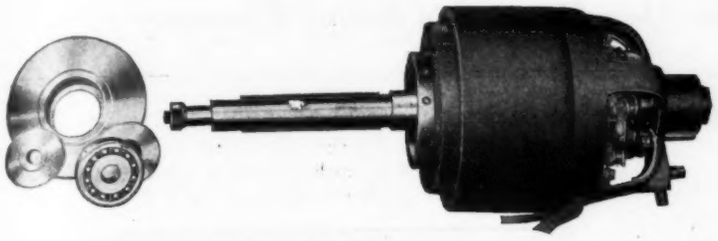
Ball bearings are designed for high speed and heavy loads. The housings are short and the motor on which they are used may be made very compact. Because of the compact construction, the distance between the bearing and pinion is reduced, hence the overhung load on the bearing is proportionately reduced.

BALL BEARINGS ON AXLE GENERATORS.

Ball bearings are now used almost exclusively on axle-driven generators for railways. A few years ago these

machines were equipped with plain bearings. The service is so severe, however, and the attention which can be given is so small, that ball bearings have proved to be the only equipment that will "stand up."

The generators are exposed to snow and ice, heat, dirt and water, the jolts and shocks of passing crossovers and



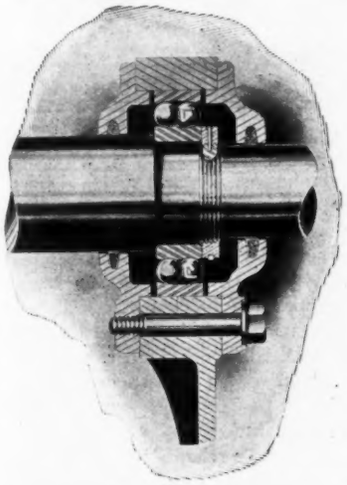
Ball-Bearing Motor Used With Vacuum Cleaner.

switches, and the continual jar of heavy truck suspension. These conditions all play havoc with plain generator bearings.

The testimony of a superintendent of inspection of one of the largest railroads in the country is eloquent with the advantages of ball bearings on these generators. He says, "The cost of generator maintenance has been reduced—on coaches, 66 per cent; on diners, 46 per cent. We have never had a hot bearing, have not lost any fields or armatures, the inside of the generator is dry, and we have no trouble due to grounds or short circuits." This is typical service where self-alining ball bearings are used.

The Lubrication Problem.

Ball bearings offer the motor user one solution of his lubrication problem. The ball bearings are contained within simply constructed bearing-head brackets with liberal lubricant chambers which are sealed on both sides and by end caps.



Mounting Arrangement With Ball Bearing on Motor Shaft.

These end caps are fitted close to the motor shaft and are practically proof against leakage of lubricant, as well as the intrusion of moisture, dust, lint, grit or other foreign substances from without.

Ball bearings are positive self-lubricators. The ball spacer or retainer is of such construction that the bearings are open at the sides, thereby giving free circulation of the lubricant in the ball paths. Oil rings, chains, or similar rotating oiling devices are done away with entirely and positive, thorough and uniform lubrication is assured.

It will be readily appreciated from the use of ball bearings on motors that:

1. They eliminate the frequent troublesome inspection of plain bearings—the user need not concern himself as heretofore about the possibility of oil rings sticking.

2. Motors equipped with ball bearings are free from the nuisance and dirty conditions caused by creeping oil and dust around the bearing heads. Frozen bearings due to oil or lint or draining of the oil reservoirs are practically eliminated. Security against such conditions in many instances is worth the cost of the motor and is particularly valuable in tevtile mills, flour mills, woodworking plants, or other places where dripping oil adds to the fire hazard, or is ruinous to stock in process.

Briefly summarizing the economies offered by ball bearings:

(*a*) Smaller air gaps permissible, because ball bearings will not wear down as plain bearings do. This gives an improved power-factor for induction motors.

(*b*) Danger of armature touching the pole pieces is eliminated.

(*c*) Leakage of oil is prevented. Thus oil cannot drip onto the commutator or oily dirt collect, causing flashovers.

(*d*) Over-all length decreased from 10 to 20 per cent, resulting in a more compact motor.

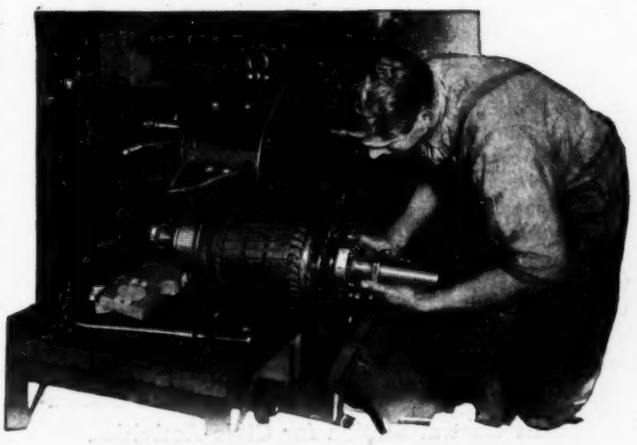
(*e*) Longer periods between motor inspection and lubrication required—once in six months against once in two weeks, with plain bearings.

(*f*) Fewer repairs and decreased maintenance cost.

(*g*) Improved motor commutation.

(*h*) Improved efficiency, because of reduction in bearing losses.

Commonwealth Edison Employees Subscribe to $506,600. Liberty Bonds.—Employees of the Commonwealth Edison Company to the number of 6043 subscribed



Assembling Bearings on Armature Shaft of Motor.

to the Liberty loan, the amount of the subscription reaching the imposing figure of $506,600. A strenuous campaign was conducted by the employees headed by a committee of which Homer E. Niesz was chairman. Committees were organized in every department, under a captain, and there was considerable rivalry between departments. It was estimated that a maximum of 5,000 employees would subscribe to the bonds and to stimulate interest an 18-foot 5,000-scale thermometer was installed in customers' hall of the Edison Building to record the progress of the campaign. The last day saw the "mercury," indicated by electric lamps, rise to the 5,000 mark and the final count showed 6,043 names on the honor roll.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Georgia Railway & Power Company Makes Huge Gains in New Business.

By the final signing and acceptance, May 30, of contract for hydroelectric power for the Pacolet Manufacturing Company, of New Holland, near Gainesville, Ga., and the Gainesville Cotton Mills, of that city, the Georgia Railway & Power Company, Atlanta, Ga., established a new high record of sales in one month. April's great record of 16,883,000 annual kilowatt-hours added to the load, equivalent almost to the total additions made in 1916, was smashed by the tremendous new total of 19,767,500 annual kilowatt-hours added in May.

Specifically, the Pacolet mill will use 3600 horsepower and 8,000,000 kilowatt-hours a year, and the Gainesville mill will use 2400 horsepower and 5,000,000 kilowatt-hours.

The Pacolet and Gainesville mills, under one management, operate together about 100,000 spindles. The former began operation in 1901 and cost approximately $1,000,000. The latter started at the same time, and its construction cost was about $500,000. Both are five-story structures.

The change from steam to complete electric drive in these two mills will involve the expenditure of about $200,000, $140,000 of this being the cost of electric equipment to be bought by the mills. Some 510 motors will be installed in the two. The estimated demand of both mills, 13,000,000 kilowatt-hours, is based on a 10-hour day.

In the case of these mills, electric power displaces the most efficient type of mechanical drive known in the United States—two cross-compound Cooper-Corliss condensing engines, with rope drive, the steam being used twice in each engine. The mills will discard engines, shafting, belting, and nearly all boilers, retaining enough of the latter only for heating the buildings, and for fire pumps, and for slashing yarn.

The securing of this contract is a distinct victory for electric drive, the owners of the mills having agreed to it only upon definite conviction that electric power cost, plus interest on the new investment, plus cost of coal still to be burned, will be less than their present steam power cost. They expect to secure more uniform speed and eliminate belt slippage, and therefore to attain a substantial increase in production at a lower cost per unit of output.

Government-Ownership Advocate Praises Indianapolis Central Station for Civic Activities.

The *Indiana Forum* is a newspaper which has consistently stood for municipal ownership. It is therefore very gratifying to the Merchants' Heat and Light Company of Indianapolis to be the subject of a very flattering editorial, which appeared in a recent issue and which comments on some of the company's noteworthy civic activities. The editorial is as follows:

"There is one firm in Indianapolis which is a real municipal asset. In a sense, of course, all business firms are a municipal asset, but this one is particularly so because of the municipal service, the public service it is constantly rendering in fields other than those from which its revenues come.

"The Merchants' Heat & Light Company occupies one of the conspicuous corners at Washington and Meridian Streets. It has great window space and in that window space it can display the electrical supplies which it has for sale, to good advantage. But as often as you will find a display of its own

Liberty Bond Window of Merchants' Heat & Light Company.

wares in those windows, you will find a display in behalf of some public or civic undertaking.

"Just last week the window space and the salesroom on the first floor were given over to an art exhibit and auction for the benefit of the Red Cross. A few weeks ago a series of displays informed the Indianapolis public of the methods of manufacturing and the products of several industries in the city. It seems that whenever a civic movement is on foot, when there is an activity in behalf of municipal improvement the Merchants' Heat & Light Company is on hand to show that a 'soulless' corporation may, after all, have a soul.

"On top of the Merchants' Heat & Light Company's building is the great electric sign—the motograph—and on it, more often than you find an advertisement for the company, you find a boost for the city or some municipal movement under way. For several weeks it preached the gospel of thrift; it boosts the Liberty Loan Bond; it appeals for a cleaner city; it pleads for the Red Cross.

"Of course the Merchants' Heat & Light Company is in business to make money. It isn't a philanthropic institution by any means. But its management has made the great discovery—the discovery which every business man will make eventually if he makes an extraordinary success—the best asset is a capacity and willingness to serve. The Merchants' Heat & Light Company is serving. It makes itself useful. The people like it. Today it is the one public utility in Indianapolis that enjoys general popularity."

Combined Electrically Operated Traffic Signal and Automatic Sewage-Pumping Station.

The accompanying illustration shows a most novel and interesting form of combined electrically operated traffic signal and automatic sewage-pumping station, developed at Abilene, Kans., at a point where originally there was located a receiving well, with an automatic air-lift pump. This device was never satisfactory and later the pump was abandoned and an electric motor and centrifugal pump were installed. One can readily imagine the outcome of such a scheme. On account of the moisture within the cistern the motor gave considerable trouble. Also, occasionally, the creek would rise high enough to flood the cistern and at such times, if the motor was in operation, it would be seriously damaged and the means of pumping would be out of commission for a time.

After enduring the second unsatisfactory device for nearly three years, the city decided to turn the proposition over to its engineer. The first thought was to invent a scheme for placing the motor in a dry place. A second revolving well was thought of at a location where the motor could be placed above the ground and be sufficiently housed. This led to an attempt to put the motor over the manhole or receiving well already placed in the intersection of the streets. It was learned that a suitable motor could be had, which, with the housing, would not occupy too much space for the street intersection, and that it could also serve as a traffic signal, thus concealing the fact that it served for any other purpose. The intersection was located in the best residence district of the town.

It is of interest to note that the housing is 30 inches wide at the base and the entire height of the housing and lamp standard is 8 feet. It is built of sheet metal and rests

Combined Traffic Signal and Electric Pumping Station.

on a concrete base. The motor sets on a concrete foundation 8 inches above the pavement grade. It is a five-horsepower three-phase 220-volt motor with vertical driving shaft, driving a 120 gallon per minute pump. It starts automatically, by means of a float, when the sewage is 8 feet above the bottom of the cistern and stops automatically before the suction pipe is uncovered. It runs about four hours per day. The cost of electricity is eleven cents per kilowatt-hour and so far this has been the only cost of operation. The motor and pump cost $260 and the housing and pump $75.

Flag-Raising by Employees of Indianapolis Company.

Employees of the Merchants Heat & Light Company, Indianapolis, Ind., held a flag-raising at the company's West Washington Street plant at noon of June 5. There was an attendance of about 600 people, comprising officials and employees of the company, and representatives of Kingan & Company, Acme-Evans Milling Company and other concerns. The flag was 12½ by 25 feet, and was unfurled from a steel flag staff extending from the roof structure of the plant, giving a height of 132 feet from the ground. The presentation speech was made by Frederick L. Ray, superintendent of plants, and this was responded to in a speech of acceptance by L. G. Rothschild, special representative of the company. The concluding sentences of Mr. Ray's speech were as follows:

"As a testimony of our loyalty to our country, to our President, and to our employers we have contributed to the purchase of this beautiful emblem of freedom and have provided for its home over our plant. I am indeed happy to have the honor of presenting to you and through you to the officers of our company, this token of our loyalty."

Mr. Rothschild, in accepting the flag, concluded as follows:

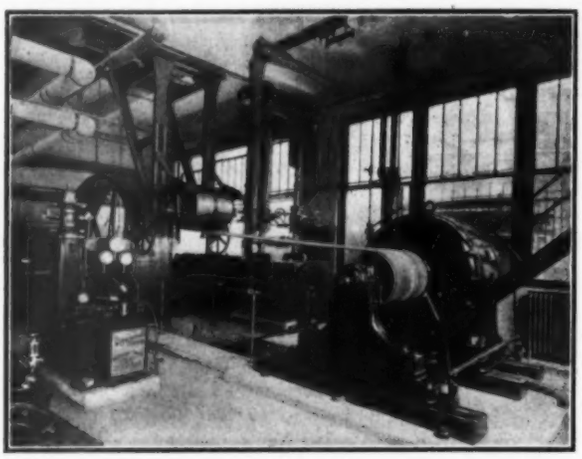
"I want you friends to understand that I reflect the sentiments of our president, H. H. Harrison, who stands foremost in civic matters as well as for our country's cause, when I say this emblem, Old Glory, shall wave a meaning over our institution, not only of country first and always, but of loyalty, integrity and good citizenship in the progressive institution for which you have labored so earnestly and so hard, and whose efforts have builded in this community so well.

Novel Plan of Dividing City Into Sales Districts Adopted by Louisville Company.

An interesting and practical plan has been made use of by the Louisville Gas and Electric Company in the division of the city into districts assigned to its salesmen. There are six districts, all of them radiating from the downtown retail section of the city into the suburbs, with a permanently employed salesman assigned to each. These salesmen respond to all inquiries from prospective customers, or from customers contemplating extending their services and canvass their territories continually. The particular advantage of this method of dividing the city is that, no matter what may be the character of the campaign to increase business that the company has on hand, all of its salesmen are in position to concentrate on a special class of prospects. If the proposition involves a commercial lighting feature, practically every salesman has about the same number of likely retail mercantile prospects as any other. In case the drive is for domestic business such as a house-wiring campaign, the various salesmen have about the same classes of customers to go after. If it is the suburban business that the company happens to be seeking to develop, the same proposition would prevail. Just now, when the company is beginning the appliance selling campaign recently referred to in these columns, each salesman is in position to work on an equality with each other salesman. One of the marked advantages of the plan is that the salesman so assigned can get into closer touch with the prospects in his division of the city. When he goes out with a new proposition he does not have to introduce himself as frequently as otherwise would be the case. The plan has been working out with great success in its use by the Louisville Gas & Electric Company.

Two-Speed Motor Drive for Refrigerating Machine in a Brewery.

The advantages of motor drive for refrigerating machinery are so conspicuous that modern practice recommends the use of motors whenever the conditions permit. The accompanying illustration of a motor-driven refrigerating machine in a large brewerey, shows some of these advantages—



Two-Speed Motor Driving Refrigerating Machine in Brewery.

the simplicity, compactness, and cleanliness of the apparatus. Another important advantage is the fact that the motor requires practically no attendance. It runs continuously without other attention than an occasional oiling.

This particular installation is especially interesting, however, because the motor is a two-speed alternating-current machine and can be operated at either 495 revolutions per minute, when it will develop 225 horsepower, or at 247 revolutions per minute and develop 113 horsepower. A special feature is that it will operate at equally high efficiency at both speeds. When the need for refrigeration decreases, as in very cold weather, the refrigerating machine can be run at slow speed with a considerable saving in operating expense.

The refrigerating machine shown is a De La Vergne 18 by 23 horizontal ammonia compressor with a capacity of 125 tons of ice in 24 hours. The motor is of Westinghouse make.

Wisconsin Gas & Electric Company Making Rural Extensions.

The Wisconsin Gas & Electric Company, Watertown division, is planning to extend its electric service from Okauchee to Ashippun, Wis., and also to build a farmers' line from Ft. Atkinson south for a distance of several miles. The Okauchee-Ashippun line will take in the farmers' homes all the way. These two lines are to be completed before Fall, and the work will be supervised from the Watertown end of the line.

An extension from Watertown to Lebanon will be completed some time in July. This is expected to give farmers between Watertown and Lebanon electric service and will also supply residents of the latter town.

The line from Watertown to Lake Mills and Marshall is almost completed, and the last named city will be given service some time in July. The current will be transmitted from Watertown by way of Lake Mills.

When these lines are completed the Watertown division will be supplying service to Clyman, Reeseville, Oconomowoc, Lebanon, Ashippun, Johnson Creek, Lake Mills, Jefferson, Port Atkinson, Whitewater and Marshall.

The Advantages of Motor Vehicles Accentuated by the Food Crisis.

A very few years ago the horse industry was one of the greatest industries in the country because of the close relationship it bore to successful and economical agricultural production as well as to the various transportation problems. Since the advent of the commercial motor truck and tractor a revolution has gradually been taking place in the cities and on the farms of the United States. The horse has become unprofitable as he is too costly to buy and too costly to keep. As Edison has said, a horse is the poorest motor ever built. He eats 12,000 pounds of food a year, the output of five acres, and yet he is only two per cent efficient. A recent government report shows that a farm horse averages only 3.5 hours of work per day, and requires at least 3000 cubic feet of space for himself and his feed. In 1915, according to J. Arthur Bell of the Bureau of Animal Industry, there were about 24 million horses in the United States, which consumed over two billion dollars' worth of hay and grain each year. The land devoted to the production of food for these horses would furnish food for a greater population than exists at present in this country—approximately 125,000,000.

There are other items which definitely disprove the horse as an economic asset to our nation. There is an enormous amount of labor devoted to the care and upkeep of horses which must be considered. For the ten million horses used in our cities, thousands of stables and street cleaners must be employed to maintain sanitary conditions, an item of approximately $10 per horse per year. In addition the tremendous amount of labor expended in hay making, corn growing, and the labor of mechanics who make horse-feed machinery,—mowers, tedders, feed grinders, etc.,—is conservatively estimated at $50 per horse per year. It is said that the iron hammered by blacksmiths into horse shoes in one year is sufficient to make 40,000 farm tractors or 60,000 motor trucks.

Aside from the economics of the food crisis, horses will probably have to be replaced by motor vehicles, since the war requirements are to be so great. An army of 2,000,000 men will need 416,000 horses and mules. An average of 33,000 horses per month have been exported for the Allies since the beginning of the war, and 11,000 a month will be needed to keep our flag advancing as fast as the others.

The initial government war requirement of over 70,000 motor trucks and passenger automobiles, as well as 250,000 horses and mules, and the great demand for petroleum; the uses of which have become so many and varied, which tend to lessen the already decreasing supply, and to make the price soar, place the "electric," both as passenger and commercial vehicle, in the foreground as the economic and sturdy means of urban transportation. The electric vehicle lends itself to practically every urban haulage need, giving exceptionally satisfactory service with extremely low operating costs, for although the cost of production has materially advanced, the cost of current has not increased, and the simple mechanism of the "electric" affords the uttermost ease of operation with the minimum of trouble and repairs, and is a worthy successor to the horse.

Charge for "Readiness to Serve" in Pennsylvania.—The Bucks County Public Service Company, Doylestown and vicinity, has established a new fixed charge of 75 cents per month to its gas consumers for "readiness to serve." The company has announced that the charge is made to provide for the cost of office expense, bookkeeping, reading of meters, collections and other overhead expenses, as well as to give prompt and efficient attention to complaints. Consumers of the company have entered a complaint against the new charge, preparing a petition for filing with the Public Service Commission.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL EQUIPMENT OF A LARGE GRAIN ELEVATOR.

New Milwaukee Elevator for Chicago & Northwestern Railway.

The new grain elevator recently completed at Milwaukee, Wis., for the Chicago & Northwestern Railway is one of the largest electrically operated elevators in the United States. It was built by the Barnett & Record Company of Minneapolis, Minn., and designed by the Toltz Engineering Company of the same city. The elevator is located along the Kinnickinnic River. It has a storage capacity of 2,000,000 bushels and the entire mechanical equipment is operated by electric motors, designed and manufactured by the Allis-Chalmers Manufacturing Company. The entire elevator was wired and all the motors connected up by the Herman Andrae Electrical Company, of Milwaukee.

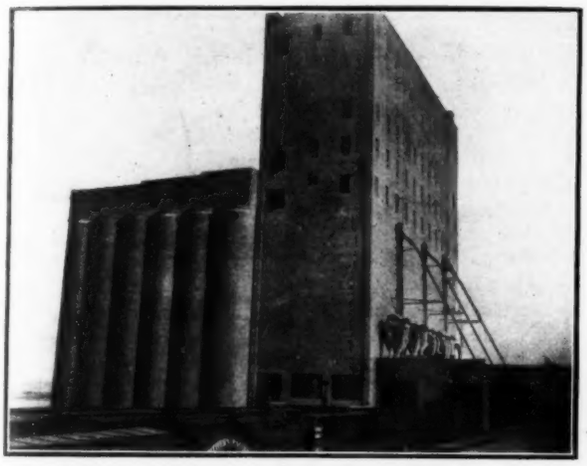


Fig. 1.—General View of Chicago & Northwestern Railway Grain Elevator, Milwaukee, Wis.

The grain is shipped in by rail from all points of the West and is stored here for market. The cars enter the train shed on the side of the elevator and cars are switched about at will by means of car movers operated by a 75-horsepower friction-drive motor. The grain is unloaded in the train shed by scooping it out through the side door of the cars and it falls down through an iron grate floor to the receiving conveyor belt below, which in turn carries it to the desired bin or location. When the grain is ready to ship, it is conveyed in the same manner to the shipping spouts which are located on either side of the building. There are docking facilities enabling any Great Lakes steamer to take on grain direct from the bins.

There is a total of 1,945 horsepower in 55 motors in the building as detailed in the accompanying table. All the electrical energy for lighting and power is supplied by the Milwaukee Electric Railway & Light Company. It is delivered to the premises at 13,200 volts, 25 cycles and is reduced to 440 volts by means of three 250-kilvolt-ampere step-down transformers located inside the detached transformer house and over the switchboard room. The primary lines are switched by a General Electric type K12 300-ampere 15,000-volt remote-controlled oil switch operated from the switchboard room in case of emergency. This room also contains four 13,200-volt aluminum-call lightning arresters.

Main Switchboard.

The main busbars of the switchboard are fed by three 1,400,000-circular-mil, varnished-cambric, lead-covered cables run in five-inch conduit from the secondary side of the transformers. The main busbars run the full length of the switchboard, which is made up of six panels of black oiled slate, 2 inches thick and 30 by 90 inches, in two sections each. The buses feed the oil switches that control the outgoing circuits and the 250-kilovolt-ampere single-phase lighting transformer located in this room. The switchboard was built by Julius Andrae & Sons Company, of Milwaukee.

The main board also contains one Sangamo integrating wattmeter for measuring the total 13,200-volt energy supplied to the primaries of the main transformers; one Weston 0-

LIST OF MOTORS INSTALLED IN C. & N. W. ELEVATOR.

Motors. No. of	Horsepower Each.	Full-Load Speed (R.P.M.)	Service.	Location.
1	7½	715	Screening conveyor No. 15.	Basement, work house.
3	10	715	Receiving conveyors Nos. 1, 2, 3.	Basement, work house.
4	20	715	Shipping conveyors Nos. 4, 5, 6, 7.	Basement, work house.
1	20	715*	Fan for cooler.	Basement, drier house.
1	20	715*	Fan for drier.	Basement, drier house.
1	75	715	Car puller.	Basement, track sheds.
1	125	1440*	Fire pumps.	Basement, office.
2	25	720*	Cooler fans.	First floor, work house.
2	25	720	Warehouse separators.	First floor, work house.
2	75	480	Oat clippers.	First floor, work house.
12	10	715	Car shovels.	Track sheds.
1	50	715	Dust collector.	First floor, drier house.
1	7½	715	Bleacher pump.	Bleacher pent house.
1	20	715	Reversible conveyor No. 14.	Bin floor.
6	20	715	Conveyors Nos. 8 to 13, incl.	Bin floor.
1	5	715	Richardson separators.	Distributing floor.
1	10	715	No. 9 Monitor screening separator.	Distributing floor.
1	5	715	Humphrey elevator.	Machinery floor.
1	40	710	Screening leg.	Machinery floor.
1	75	715	Drier leg.	Machinery floor.
3	75	715	Cleaner legs Nos. 1, 2, 3.	Machinery floor.
3	100	720	Receiving legs Nos. 1, 2, 3.	Machinery floor.
4	100	720	Shipping legs Nos. 1, 2, 3, 4.	Machinery floor.
1	5	715	Freight elevator.	Pent house.

*Variable-speed slipring type induction motors. All other motors squirrel-cage induction type.
All motors are three-phase, 440 volts, 25 cycles.

15,000 voltmeter; one Weston 0=100 ammeter; a Weston power-factor meter 0.50-1.00-0.50; one eight-point potential receptacle and a four-point potential plug; three ammeter receptacles and an ammeter plug. To the instrument transformers for the integrating wattmeter is also connected a 1,000-kilowatt Esterline recording wattmeter installed in the foreman's office.

Power Circuits.

From this main switchboard the various power circuits emanate. These feeders pass through 13 three-inch galvanized iron conduits running underground and imbedded in concrete to the basement of the elevator, which is about 80 feet distant, where they terminate in a large junction box 3 by 3 by 5 feet in size, which is located at the bottom of the riser shaft. This fireproof shaft also contains a spiral stairway and extends the full height of 180 feet to the top of the elevator.

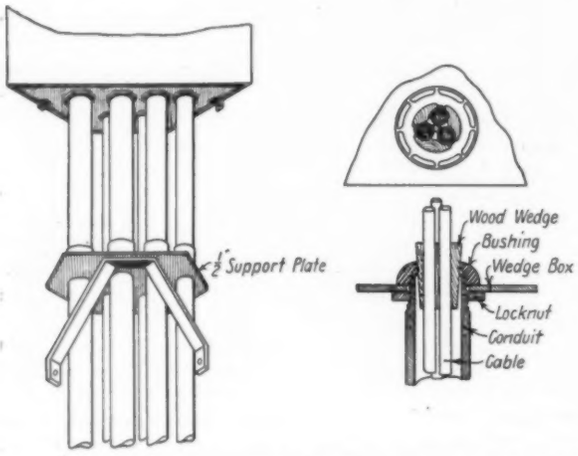


Fig. 2.—Method of Supporting Conduits in Riser and Cables in Wedge Box.

These cables in the underground conduits range from No. 0000 to 500,000 circular mils in size and are all varnished-cambric-insulated lead-covered single conductors. The conduit is sealed at both ends by Chatterton compound to prevent any moisture from penetrating the splices in the junction box.

From the top of the box the power circuits extend up in the shaft in conduit containing the same size, double-braided cable as underground and branch off at the different floor levels to their respective cabinets. These conduits are supported at regular vertical intervals of 20 feet up the shaft by one-half-inch boiler plates drilled to pass the various conduits. They are fastened to the building structure by bolts and brackets as shown at the left in Fig. 2. The conduits are arranged to let the couplings rest on the upper side of the plates and therefore relieve all strain from the bushings in the wedge boxes.

These are located every forty feet in the shaft and all the riser conduits terminate here and pass out at the tops. These wedge boxes are installed to provide means of supporting the cables in the conduits. This is done in the manner shown at the right in Fig. 2 and eliminates all tension at the top from the excessive weight of the cable. The conduits branch off at the various floor levels to the power distribution cabinets.

Motor Wiring.

The motors are fused here and the branches are run from these cabinets in rigid conduit to the motor starters. Instead of terminating here with condulets, as is usually the case, two small junction boxes with screw covers are bolted to the sides of the starters and the conduits terminate in the sides of these and the feed wires are tapped on the leads of the starters, the splices being inclosed in the box. This method protects the wires from injury and makes an absolute dustproof job. From the other side of the starter the conduit continues to a similar junction box screwed to the frame of the motor. A piece of flexible steel conduit is between this box and the rigid conduit to provide play for sliding the motor on its rail. This flexible is fastened to the iron conduit by means of a coupling with one-half of the threads turned out and clamped with set-screws. The splices are made in the junction box in the same manner as the starter. The arrangement is shown in Fig. 3.

The dust in grain elevators is of a highly inflammable and explosive character. Nearly all motors are therefore of the squirrel-cage induction type and all the motor and other leads are inclosed in iron conduit so that no fire hazard exists from the electrical installation. All splices are securely soldered and taped, and all conductors are of generous sizes to prevent undue heating in any part of the system. The distribution cabinets also have a felt strip between the door and the box which makes another dustproof job. These precautions not only resulted in an absolutely dust and fireproof installation, but also made a very substantial and workmanlike job.

Telephone and Signal Systems.

There is also installed an intercommunicating telephone system of the central-energy type with about a dozen telephones. Each instrument is installed in a dustproof cabinet. The circuits are all lead-covered cables in conduit. Ringing energy for the telephones and all other bells is supplied from duplicate sets of 80-volt bell-ringing transformers.

Four speaking tubes were installed with one-inch conduit and large-radius bends. At each outlet is three feet of flexible tubing with mouthpiece and whistle. For the freight elevator there was installed a red lamp and snap switch at each of the six floors and so wired that the switch at any floor controls the lights on all the floors; the wiring was all in conduit. At each end of the ticket elevator there was placed a push button and five-inch bell arranged so that either button would ring both bells. At each floor there was also installed a button and loud-ringing warning bell wired so that any button would ring all the bells simultaneously. All bells are dustproof and wound for 80 volts.

Special lamp signals were provided for each leg and at other operating points, usually in pairs with one red and one green light so wired that turning one off turned on the other.

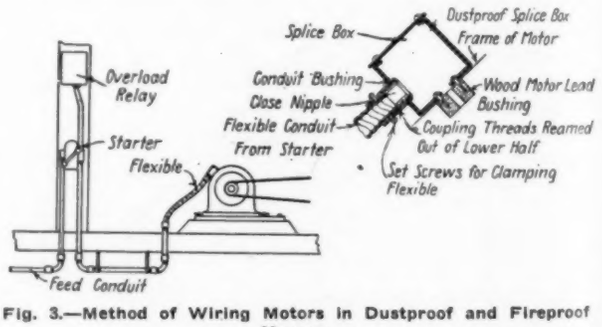


Fig. 3.—Method of Wiring Motors in Dustproof and Fireproof Manner.

Special arrangements of light signals were also made, the principal ones being as follows: Over each receiving pit in the car shed there is a red and a green light, the latter switched on when the interlocking lever closes the valve in the bottom of the car pit. The red light turns on when this lever opens the valve and also when the unloading foreman pushes a button indicating that the car is completely unloaded; this also rings a gong on the first floor of the work house and leaves a white pilot lamp lighted there. There are

three receiving legs, each with four car pits, and each pit has one of these pilot lights which remain lighted until turned off by a button directly below each lamp.

The red and green lights for each leg are arranged so that the green lamp indicates that the garner in the cupola above is empty and ready to receive grain. The red light indicates that the garner is in use. It lights up and the green goes out automatically when the interlocking levers open any of the car-pit valves. The turning on of the green and off of the red lamp can be done only from the scale floor, where there is a pair of these lamps for each of the four pits for each receiving leg. The green lamp indicates the pit valve is closed, while the red lamp shows it to be open. If all four green lamps are lighted it shows all pits closed and the leg running idle. Normally three lamps show green and only one red, because the interlocking levers permit only one pit valve to be open at one time.

Simple Means for Making Connecting Devices Still More Interchangeable and Safe.

By Arthur Barthels.

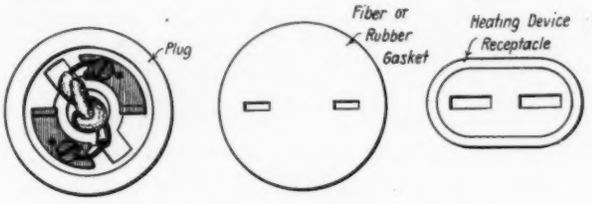
For a year or more a committee of the National Electric Light Association has been making efforts among electrical manufacturers to bring about standardization of attachment plugs and receptacles. Considerable success has been met with, but so far efforts to standardize the terminals and connections for heating devices of the portable type has not been far developed.

I have found that it is a good plan to keep a cord on the dining-room table, arranged so that it can be plugged in to any heating device, whether toaster, percolator, chafing dish, etc., without the necessity of using a special type of connecting device at the end for each appliance. In my home I have used heating devices made by a well-known California manufacturing concern, all of which employed the same kind of terminals. Since this cord is always connected, I have found it a convenient means to attach to the end of it an extension cord, so as to connect with an electric radiator or other device, placed in a corner of the room some distance from the table. The heating-device receptable has a metal protecting cover, which prevents the porcelain body from being broken if it is dropped. I found on connecting the cap of a separable attachment plug with flat prongs into this heating-device receptacle that the metal flange on the latter would short circuit the line because it would come in contact with the binding screws to which the cord is fastened. To prevent this I have taken a thin sheet of fiber and made a gasket of it, with two slots just large enough to slip over the flat prongs of the cap of the plug. This gasket is then placed over the open end of the plug and serves to insulate its binding posts from any metal surface it may come in contact with. The arrangement is well shown in the accompanying sketch with its three parts.

The gasket or insulating cover can be easily made by using a punch made out of a piece of pipe or tubing about 1⅜ inches in diameter, this pipe cutter having a cutting edge filed on it. Disks may be cut out of any fiber or sheet rubber; an old inner tire tube can be used, if the device is not to be used in a place where it will be highly heated. The two slots can be punched out with a quarter-inch chisel so as to slip over the cap prongs.

I have found that this scheme is suitable not only for the purpose mentioned, but also for removing the liability for trouble from stray strands of the cord working out from under the screws (if the cord has not been securely knotted and fastened) such strands coming in contact with grounded face plates of wall receptacles or other metal surfaces.

I believe that in the standardization of plugs and receptacles a scheme should be carried out so that these may be entirely interchangeable, not only for the articles commonly used, but interchangeable with heating-device cords also. Moreover, I would like to see manufacturers equip the caps of plugs at the factory with these inexpensive covers, thus removing the remote but possible faulty connection by careless workmen. I make these suggestions purely in the spirit of constructive criticism, which I find many manufacturers are glad to receive.



Insulating Gasket to Permit Safe Connection of Attachment-Plug Cap and Heating-Device Receptacle.

New Regulations Governing Examination and Licensing of Electricians in New York City.—The Department of Water Supply, Gas and Electricity of New York City has issued new regulations for the examination and licensing of electricians. Two kinds of licenses are issued, the "Master Electrician's License" and the "Electrician's Special License," the latter being for electricians engaged principally in maintenance work in buildings or plants. Holders of such special licenses are held strictly accountable for the maintenance in proper condition of the electrical equipment in their charge. The new regulations give the general rules covering the examinations for and issuance or revocation of licenses. Among reasons for such revocation or suspension are the following: Failure to display license, licensee's name and occupation at established place of business, failure to file application for inspection before beginning work, failure to correct violations pointed out by inspectors, performance of work contrary to the requirements of the New York Electrical Code.

Among the Contractors.

R. W. Canterbury of Piqua, O., has sold his interest in the Piqua Electric Shop and has opened an office at 315 Franklin Street, Piqua, O., where he will continue his electrical contracting business. Mr. Canterbury desires to secure catalogs and price lists from manufacturers and jobbers.

The Binder Electrical Company, Trenton, N. J., has been awarded the contract for electrical work in the new bank building to be erected by the Mercer Trust Company at South Broad and Market Streets.

Fred P. Merkel, 533 Central Avenue, Newark, N. J., has been awarded a contract for ventilating and heating equipment in the Greene Avenue School, Madison, N. J., at a cost of $14,556.

The Hegan-Magruder Company, Louisville, Ky., has been organized and is taking over the business of the Hegan Company, 520 West Chestnut Street and the Brecher-Buck Company, 316 West Market Street, dealers in electrical fixtures, as well as mantels, tile, fireplace fixtures and accessories. Clearance sales are being held at both of the stores preparatory to consolidation of the stocks.

Paid advertisements have been inserted in Frankfort, Ky., daily papers, calling attention to the fact that there is an organization of electrical workers in that city. This leads up to the argument that only competent workmen are given union cards and that if the people who engage electrical workers will ask to see the union cards they will assure themselves that they are getting competent labor.

DOLLAR WIRING KINKS

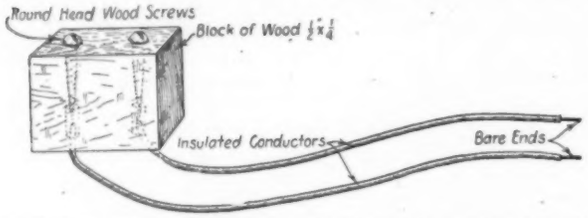
All readers are invited to contribute to this department. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must be new and bright. A dollar will be sent to the contributor upon publication.

Tight Crimping of Rings for Telephone Cables.

When crimping on suspension rings to a telephone messenger strand for the cable, the rings frequently get loose and shift from the desired location. To prevent this, two pieces of one-half-inch pipe 12 inches long can be slipped onto the handles of the crimpers and the increased leverage will tighten the rings so that they will remain tight and properly spaced. MAURICE J. MORIARTY.

Test Block for Bell Circuits.

Many electricians, when making repairs to bell or buzzer circuits, are in the habit of testing for current with the tongue by removing the wires from the bell and placing them on the lips. This is very simple and effective, but far from sanitary or even clean. The idea occurred to me by making a little test block of hard wood with holes drilled through for two



Small Test Block for Determining Presence of Battery Current by the Tongue.

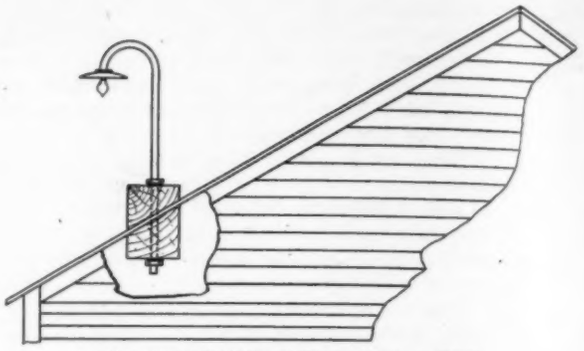
round-head wood or machine screws to the ends of which a pair of test wires are soldered; a piece of lamp cord will do, but the free ends should be stiffened by soldering. By placing this block between the teeth the hands are left free to manipulate the free ends of the test cord. The screw heads should be nickel-plated and the block can be kept in a small pill box to keep clean. JOHN DOMERHUIZEN.

To Avoid Marring Furniture When Standing on It.

The electrician frequently is called to make some minor but quick repairs to sockets, etc., especially when fuses have been blown. Since a step ladder is not always available, he is compelled to stand on desks, tables, chairs or other furniture in order to reach fixtures or other sources of trouble. An ordinary piece of newspaper may not be thick enough to avoid marring the polish of the furniture by the heels of the electrician. I have found that a piece of corrugated cardboard, such as is used for wrapping glassware, etc., can be used with entire freedom from marring polished surfaces. It is a good plan to carry some pieces of this along in the tool bag for this purpose. J. T. CARROLL.

Simple Lighting Fixture on Roof.

While recently installing some outside lighting on a building, it became necessary to place some fixtures near the edge of the roof. We used the method illustrated in the sketch for mounting these fixtures. The conduit after being cut to proper length and bent was threaded on the lower end about 9 inches. An oak block about 4 by 4 by 6 inches was cut in half to the slant of the roof and each piece bored to pass the conduit. A washer and locknut was put on the conduit on each free end of the block. Before the nuts were



Mounting Lighting Fixtures on a Roof.

tightened hot tar was poured between the upper half of the block and the roof, and around the conduit to fill the hole in the block completely. The upper washer was then pressed down and both nuts securely tightened before the tar had hardened. A waterproof, rigid and inexpensive job was obtained in this way. ARTHUR S. NICKERSON.

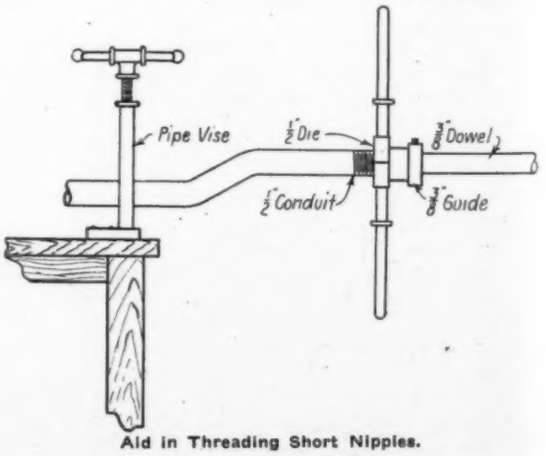
Use Solderless Connectors in Wiring Electric Ranges.

While installing wiring for numerous electric ranges recently I found it difficult at times to make satisfactory soldered joints with the wires that lead from the range, since these are generally either of No. 8 or No. 6 size and, being very stiff, it is not easy to make good connection when the range is in such a position close to the wall that it is difficult to get at the ends of the wires. It occurred to me that a good form of solderless wire connector, such as the well-known Dossert type, would be just the thing. On looking this up I found that these connectors in various sizes and types were approved by the Underwriters' Laboratories for all standard wire sizes. Consequently I have used them for nearly all range connections, especially in tight places such as mentioned above. They are quickly installed and permit disconnecting the range easily, should this become necessary. The outside of the connector should be well taped in each case. L. F. BLUBAUGH.

Cutting Thread on Short Nipples.

In cutting a thread on one-half-inch conduit for a short nipple or offset, where it is necessary to reverse the dies in the stock, I have found it a good stunt to have a piece of three-eighths-inch dowel rod (a package handle will do) and drive it in the end of the conduit, using the three-eighths-inch guide in the stock to keep the dies straight. Three-eighths-inch gas pipe is better, but one end will have to be turned or filed to slip into the one-half-inch conduit.

JAMES FREDERICK.



Aid in Threading Short Nipples.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 392.—Depreciation Charge and Cost of Reinstallation.—When setting aside an annual depreciation charge for replacing wornout, obsolete or other unsatisfactory utility equipment, is it customary to provide in this charge for the cost of installing the new apparatus or other equipment, or merely for the cost of purchasing new apparatus for that thrown out? In the latter case, to what account should be charged the cost of setting and connecting the apparatus in place?—B. E. H., Maywood, Ill.

No. 393.—Maintenance of Underground Lines.—What has been the actual cost of the maintenance of underground cables, conduits, etc., for series street lighting at various voltages and different systems, exclusive of electrolier maintenance? What does this maintenance consist of?—T. S. P., San Francisco, Cal.

No. 394.—Transformer Design.—I would like to know the size and amount of wire for a transformer with 110-volt primary and 6-volt, 10-ampere secondary, to be used on a 60-cycle circuit. The core I would like to be of rectangular shape and square cross section, made from sheet-iron stampings. The transformer is to be used with a number of low-voltage lamps.—R. W. M., Mabel, Minn.

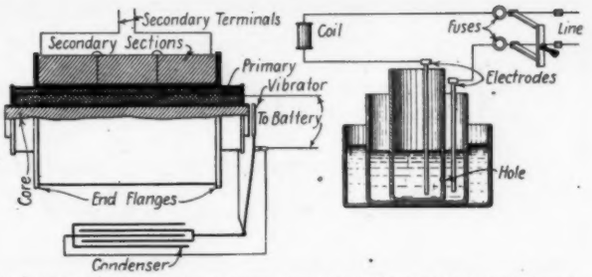
Answers.

No 388.—Induction Coil for Wireless Set.—I would like to secure data for building a four-inch induction coil to be used on a small wireless set. It is to operate on 110 volts direct current, but if the primary will not stand that voltage, I can probably reduce the voltage to the required amount. I would like to find out the following: Length of primary and secondary coils; number of turns on each; number of layers on each; size of wire for each coil, and amount of wire in pounds for each; also the diameter of core. Can single cotton-covered wire be used on secondary?—R. C. S., Pontiac, Ill.

Answer A.—Wireless spark coils require a different design from ordinary spark coils. The core is made of a bundle of straight soft iron wires. The vibrator is a medium-speed vibrator and it is cheaper to buy it directly from a supply house. The following data are given for the four-inch spark coil shown in the accompanying diagram:

Length of core in inches	8¾
Diameter of core in inches	1
Insulation on core	empire cloth
Thickness of insulation on core in layers	3
Size of primary wire (double cotton-covered)	No. 16 B. & S.
Number of turns of primary wire	232
Kind of insulating tube	empire cloth
Thickness of insulating tube in layers	8
Size of secondary wire (enameled wire)	No. 36 B. & S.
Number of pounds of secondary wire	2
Number of sections in secondary	3
Approximate diameter of secondary, inches	4
Distance between coil heads, inches	6
Total number of square inches in tin foil in condenser	10,500

This coil operates on one or two six-volt storage cells. It may be used on 110 volts alternating or direct current, providing an electrolytic interrupter is used with it. The sketch shows this interrupter. It is inexpensive to construct, Mason fruit jars being utilized. Either brass or lead electrodes are used. The electrolyte may be made up from water and sulphuric acid, or else water and sal ammoniac. The proper amount is found by experiment. It is advisable to use the cooling jar as shown, since the interrupter heats rapidly when in use. The only difficulty in construction will probably be the hole in the glass jar. This may be readily bored with a new sharp twist drill, using turpentine as a lubricant. The hole should not be too large, or too much current will pass. The following sizes for the holes are suitable: 3/32 inch for coils giving up to three-inch sparks. ⅛ inch, largest size advised.—G. L. H., Chicago, Ill.



No. 388.—Design of Induction Coil for Wireless Set and Simple Electrolytic Interrupter.

Answer B.—In order to build a successful spark coil it is necessary that the insulation of its component parts is right up to the highest standard. The core for this coil will consist of a bundle of 22-gauge soft iron wire 13 inches long and 1½ inches diameter. The core must now be insulated.

The primary coil consists of two layers of No. 12 B. & S. gauge double-cotton-covered copper wire. Procure a fiber or hard-rubber tube, the dimensions of which are 1¾ inches inside diameter, 2¼ inches outside diameter and 12 inches long, and place the core and primary coil within it.

The secondary coil will consist of 4½ pounds of No. 36 B. & S. gauge single-silk-covered copper wire, and should be wound in sections; each section should be a disk 3/16 inch thick, 4½ inches outside diameter and 2¼ inches inside diameter. These disks or sections should then be assembled on the completed primary and core with four disks made from a good quality of paper and dipped in molten paraffin between each secondary disk, the connecting wires from each disk being brought up between the four paper disks to insure good insulation. The disks or sections are then connected in series on the outside.

The secondary may be wound, if desired, without having any connections to make, by using the completed primary for mandrel as follows: Cut a circular piece of fiber or hard rubber to fit tight on the tube enclosing the primary coil and place it at one end of the same; make a similar piece to slide easily along the tube with provision for clamping it at any point on the tube; these are all the extras required. Put three paper disks on the tube, two against the end piece and one against the sliding piece, and clamp the latter firmly with a clear space of 3/16 inch between the pieces. Bring the end of the secondary coil up between the end piece and the two paper disks and the section is ready to be wound. The core should be mounted in a lathe or some such contrivance which will turn it easily and quickly. As the wire is being wound onto the tube it should be run through molten paraffin to make the wires adhere.

When the section has been filled up to the required diameter the sliding piece may be loosened and four paper disks put on, the sliding piece being again adjusted as before. The wire may now be brought down between the paper disks, care being taken to have two disks between it and each section of the secondary winding. This method eliminates joints. The finished coil should be thoroughly dried and then saturated with molten paraffin.

For use on 110-volt current you will have to make or buy an electrolytic interrupter.

Single-cotton-covered wire can be used in the secondary, if desired, but the dimensions of the entire coil will be greater since this takes up about 30 per cent more room than single-silk-covered wire. If the secondary is wound with single-silk-covered wire its length will be about 10 inches, but if single-cotton-covered wire is used it will be about 13¼ inches long.—J. H. McI., Sharon, Pa.

New Electrical Appliances

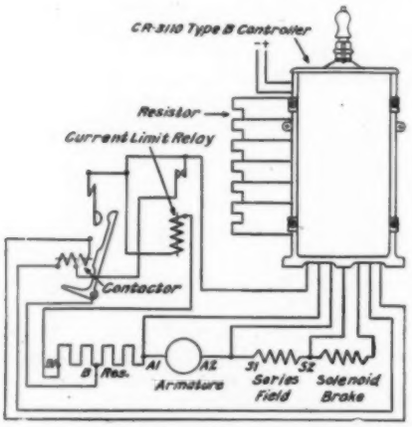
A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Semi-Magnetic Dynamic-Braking Control for Crane-hoist Service.

The General Electric Company, Schenectady, N. Y., has recently brought out an automatic device which can be added to its standard type B drum controller and thus make a very serviceable semi-magnetic dynamic-braking control for crane-hoist service.

The additional equipment consists of (1) a panel for wall mounting which contains a direct-current contactor and current-limit relay, and (2) an extra resistance which is inserted in the circuit during the acceleration and deceleration period.

A dynamic-braking, manually operated, drum-type controller is more severe on the commutator of a direct-current series motor than is a plain reversing manual controller, because when lowering the motor is connected similarly to a shunt-wound motor and does not have the inherent protection



Connections for Semi-Magnetic Dynamic-Braking Hoist Controller.

of the series field. In many installations where the service is severe a semi-magnetic equipment will materially assist commutation. This equipment is useful also where the service is not quite severe enough to justify the expense of a full-magnetic equipment.

The connections, when used with the dynamic-braking controller, are shown in the accompanying diagram. The extra resistance *B-B1* is to be added to the block *A-B* regularly furnished with this controller. With the new arrangement this block of resistance would be so high that it would be impossible to damage the motor, no matter how quickly the controller was thrown on and off. The contactor and relay simply insert and cut out this resistance when accelerating and decelerating in such a manner as to give practically the same speed characteristics on the motor as would be obtained with a standard controller and at the same time prevent abusive currents.

This device therefore protects the commutator from severe arcing. It protects the controller finger and segments from severe burning. It enables the motor to run at a higher lowering speed for a given severity and condition of service, provided extra resistors are used to weaken the motor field.

Convenient Combination Wall Switch and Receptacle.

Even though the wiring plans of an electrical installation call for what may appear to be an abundance of outlets, a need for more usually develops after the job is finished. Moreover, extra taps for such appliances as vacuum cleaners, fans, etc., must be provided. Ordinarily troublesome and expensive alterations and additions to the circuits must be made or unsightly makeshifts are adopted. But by means of the Spartan combination outlet and type O switch, shown herewith, the requirements are met in a very simple manner. This device is one of the standard line of Spartan receptacles and plugs manufactured by the Bryant Electric Company, Bridgeport, Conn. The device can be substituted for the ordinary double-pole switch, and fits the standard single switch box.

In connecting the combination into the circuit, the line wires may be attached to either end of the device. When wires are attached to the switch end, the switch controls the receptacle member of the combination as well as the outgoing circuit from the switch proper. If the wires are connected to the receptacle end of the device, current may be taken off through the receptacle irrespective of the position of the switch and the switch of course will then control only its own outgoing circuit.

While the switch has but one button, as will be noted from the illustration, the indication of the condition of the switch circuit is readily apparent, for the words "On" or "Off," as the case may be, are plainly visible through an oval aperture in the end of the button.

The type O switch unit of this combination is provided for double-pole connections only. Any of the seven different forms of Spartan attachment caps (reversible or non-reversible polarity) can be used for plugging into this receptacle, as can also the plugs of several other manufacturers who are making a standard line of receptacles and plugs interchangeable with the Spartan line.

Combination Wall Switch and Receptacle.

New Apex Electric Washers.

The new electric washers manufactured by the Apex Appliance Company, 3223 West Thirtieth Street, Chicago, operate on the oscillating tub principle. The tub is all-metal, made in a generally triangular form with a peak or "apex" at the bottom. On the sides, horizontally, are attached V-shaped strips as well as on the "apex" at the bottom. These act as shoulders to give a positive throw to the contents when the tub is oscillated.

It requires but little power to swing the tub from side to side, for it is so hung that when filled it is in perfect balance. When the filled tub is oscillated, the contents are thrown from one side to the other, first forcing the water through the goods and then the goods through the water. As the mass strikes the sides of the tub the ribs hold the pieces up, forming an air space beneath into which the water rushes, thus forcing the steam and air through the garments.

On the return throw of the tub the water tends to move first, thus producing a partial vacuum under the pieces that are lying across the "V" ribs. This vacuum sucks the steam through the goods in the opposite direction to which the water and the pieces are moving. This double action or pressure and suction loosens and carries the dirt out of the clothes.

The apex in the bottom curves up the course of the water and clothes passing over it so that they cross the main mass in its progress from side to side. In addition, the hollow at the side of the apex is filled with steam, which is driven through the clothes by the force of the water thrown into it. The greater space gives a stronger vacuum suction.

There is no chance for wadding the clothes, for they are turned first one way and then the other, and it is claimed that one piece will be washed alone as well as a tubful.

At the bottom of the tub is the settling chamber and drainage pipe. All the heavier dirt drops into this and cannot be carried back into the clothes. By drawing off the dirtiest water after each batch of clothes it is unnecessary to renew all the water for each tubful.

The tub rests upon two outside bearings so there is no chance of lubricating oil getting into the clothes. The bearing spindles are attached to the tub through spiders which distribute the strain to the entire end surfaces of the tub and prevent any chance of twisting at the end where the power is applied. These spiders also serve to stiffen the tub.

The lever shown at the left in the illustration serves to start and stop the motion of the tub. When this lever is put to the running position it engages a clutch. This starts a shaft on the end of which is a crank to which are connected the arm and spring by which the tub is oscillated. The spring serves to catch the load at the end of the oscillation and starts the tub back so that very little power is required to overcome the inertia of the load at each end of the oscillation.

The main shaft is always in motion. It is provided with a special oiling device which lubricates the bearing automatically. The wringer shaft is gear-connected to the main shaft and is also in motion continually when the motor is running. To start the wringer in either direction, the small hand lever at the top is moved to the right or left, depending upon the direction the wringer is to rotate. A safety release is provided to relieve all pressure on the rolls in case of accident or jamming of the clothes.

The machine is metal throughout and all gears and other parts which might injure the operator are protected. A safety catch is provided which makes it impossible to start the tub until the catch is released. The wringer can be operated in several positions.

The outfits are belt-driven by Robbins & Myers special washing-machine motors of ⅜, ⅛ and ¼-horsepower capacity, depending upon the size of the washer.

Apex Motor-Driven Washing Machine.

Simple Type of Projector for Protective and Miscellaneous Flood Lighting.

The great demand for projector lamps for use in the protective lighting of industrial plants, bridges, etc., is bringing about the development of new types of this equipment, of which one of the simplest is illustrated herewith. It is manufactured by the Luminous Unit Company, 2615 Washington Avenue, St. Louis, Mo., and is made in two sizes, one having a reflector diameter of 10 inches and the other of 14 inches. In each case these projectors are intended for use with standard type C Mazda lamps, which are more readily available and give a longer life than the special concentrated-filament flood-lighting lamps. The smaller projector is especially

Flood-Light Projector of Simple Design.

suited for 200-watt lamps, while the larger one can accommodate either 300, 400 and 500-watt lamps. The lamp is used in the pendent position.

There is a simple focusing arrangement for adjusting the beam from a narrow, highly concentrated and powerful beam to a wide flood as required by the prevailing conditions. The adjusting screw is outside the case and readily accessible. By means of a trunnion and pivot arrangement the entire projector is quickly adjustable in both the vertical and horizontal planes so as to have its light thrown exactly where wanted. Wing nuts permit locking the adjustment.

The reflector has a parabolic shape and is made of highly polished metal, thus providing an efficient and durable reflecting surface. The case is well ventilated and at the same time weatherproof. It is mounted on iron pipe. These projectors are furnished either with painted or sherardized finish.

Palmer Inclosed Safety Switches.

The very general use of electric motors in industrial plants where relatively unskilled labor is employed necessitates the provision of such electrical equipment as will be in line with the "Safety-First" movement. For this purpose the Palmer Electric & Manufacturing Company, Boston, Mass., has developed a line of combination safety switches and cutouts. In the accompanying illustration can be seen one of these devices, from which it is evident that the switch is completely protected in a steel cabinet, with a small panel in the center to give access to the fuses. The cabinet is a rigid steel stamping, with corners of double strength. It is provided with interchangeable conduit outlets and bushing plates for open-wire installations. Either conduit or open-wire connections may be made without bends to meet the box, which may be mounted in any desired position. During installation both switch and cutouts may be easily removed so as to permit the wires to be pulled into place, and the arrangement of the terminals is such as permits a neat job of wiring in either branch, loop or end-run connections.

The cutouts are arranged for National Electrical Code standard cartridge fuses and these will protect the switch, regardless of the direction from which the service wires enter. The fuses are always dead when the switch is opened and it is then only that refusing can be done. The shutter or center panel of the box can be opened only when the switch is open. In this case the shutter locks the switch open while the fuses are exposed. When the switch is closed the shutter is likewise locked in a closed position. If desired, this shutter may be sealed to prevent access to the fuse compartment. A padlock on top of the front cover plate locks this in position and can also be used to lock the switch in its open position.

It will be observed in Fig. 3 that the fuses move with the switch blades so that their terminals are dead when the switch is open, that the barriers *B* prevent access to the service terminals *C* and that the service and load wires may enter or leave from either side or end without affecting the safety value of the device.

When the fuse-chamber shutter has been moved to expose the fuses it locks the switch handle in an open switch position, and when the shutter has been moved to close the fuse chamber, the slot in the shutter marked *A* registers with the switch handle, permitting the switch to be closed, as shown in Fig. 1.

With this construction it is obvious: first, that when the switch is open the fuse terminals must be dead; second, that as the shutter positively interlocks with the switch handle, the fuses cannot be exposed when alive; third, that when the fuses are exposed the barriers effectively prevent access to any current-carrying part.

Fig. 1.—Palmer Inclosed Safety Switch In Closed Position.

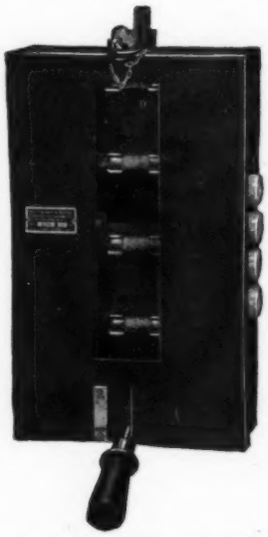


Fig. 2.—Switch in Open Position and Fuse Shutter Opened to Expose Fuses.

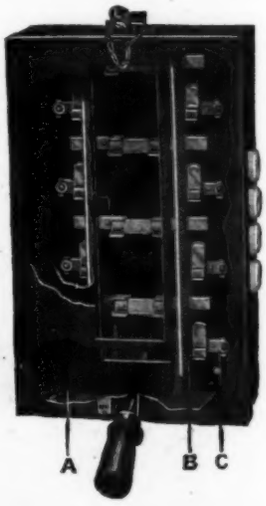


Fig. 3.—Interior of Cabinet Specially Exposed to Show Double-Break Switch Open.

These safety switches are made for 250, 500, 600 and 3000-volt circuits, with two, three or four poles, and arranged in capacity from 30 to 400 amperes, except for the higher voltages.

New Type of Combined Recording-Demand and Watt-hour Meter.

The demand system of metering is becoming general in central-station power contracts. With large power requirements, it is common to fix the rate for the service by the time and duration of occurrence of the maximum demand as well as by the amount of this demand. To determine this, a reliable demand meter giving a permanent graphic record is required.

The Westinghouse type RA recording-demand watt-hour meter in one unit measures both the kilowatt-hours consumed and the integrated demand. It indicates on a four-counter dial the total kilowatt-hours consumed and records in a permanent form the integrated demand over successive predetermined time intervals. It is installed as an ordinary

Fig. 1.—Combined Recording-Demand and Watt-Hour Meter.

watt-hour meter and requires no additional apparatus or wiring. The measuring and recording elements are mechanically interconnected; there are no electrical contacts to become inoperative. The recording element and time interval are controlled by an exceptionally high-grade clock having features that make not only for clock accuracy but for reliability of continuous operation. The measuring element is the standard Westinghouse type OA watt-hour meter with special gear train.

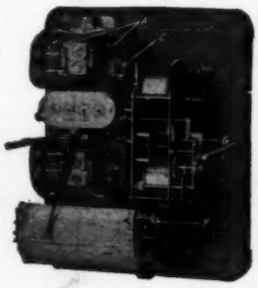


Fig. 2.—Recording-Demand Watt-Hour Meter Without Cover, Showing Mechanism.

Under load, the gear train of the watt-hour meter advances the counters in the regular manner. At the same time the gear train causes the ink-carrying pen to advance across the record paper in proportion to the energy registered. At the end of a predetermined time interval a stud on the reset wheel releases the pen gear from mesh with the gear train and a balancing weight returns the pen to zero, where it is again meshed with the gear train to repeat its advance during the next time interval. Meters are made for 15, 30 or 60-minute intervals; a meter made for one interval can readily be changed to operate at one of the other intervals.

Irrespective of the time interval of the meter, an operating spring, controlled by the clock causes the paper to advance one-sixteenth inch every 15 minutes. Thus, if the meter is arranged to have 15-minute intervals, the paper advances just before the pen is reset, so that the pen makes a distinct and readily observed record of the maximum pen travel (Fig. 3), showing both the amount of integrated demand and, by the time calibration printed on the record paper, the time of its occurrence. If the meter is arranged to have 30-minute intervals, the paper therefore advances one 15-minute space between periods, causing an offset mark on the chart at the middle of the 30-minute interval. (See Fig. 4.) This offset mark enables the reading of the integrated demand at 15-minute intervals, as well as at 30-minute periods. Similarly, if the reset wheel is set for 60-minute intervals, three offset marks indicate the 15-minute demands between each regular one-hour demand.

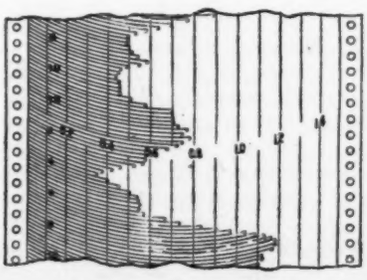


Fig. 3.—Typical Record of Demands at 15-Minute Intervals.

The entire meter is mounted on a cast-iron base. The cover is of pressed zinc with dead black finish and is fitted with a dustproof gasket. The glass windows over the dial and chart are well sealed. The electrical measuring element consists of the standard Westinghouse type OA watt-hour meter on its own supporting casting but without cover. Therefore this element can be removed from the case as a unit without changing the calibration.

The paper-driving mechanism is a metal drum with pins that engage in perforations in the record paper, driven through gearing by the operating spring. The paper, which is furnished in 18-foot rolls (36 davs' supply), is held on a spindle and is wound off this onto a drum by the driving mechanism.

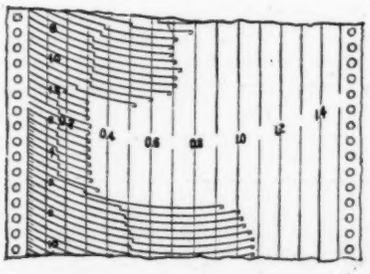


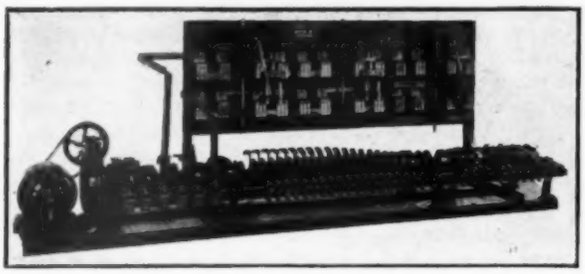
Fig. 4.—Typical Record of Demands at 30-Minute Intervals, Showing Also the 15-Minute Demands.

The type RA recording-demand watt-hour meter is made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Flasher for Large Theater Sign.

To secure unique effects in electric signs involves not only considerable study on the part of the designer of the sign itself, but also of the flasher which is to operate it. A large new sign that has attracted much attention is the one recently installed on the Nixon Theater in Philadelphia. The flasher for operating it is shown in the illustration on next page. It includes a three-circuit remote-control switch. The position of the flasher illustrated shows two circuits closed and one open.

This flasher was made by the Betts & Betts Corporation, New York City, which claims definite advantages for the remote-control switches used in that it is impossible to burn out the magnets or to dead-center the switch and it is impossible to get current into the opposing magnet while the switch is moving. Consequently, if the line of either magnet becomes short-circuited it does not affect the switch. The switch mechanism is exceptionally durable because in this case it opens and closes a circuit carrying 100 amperes about three times per minute. The contacts on the flasher, as can be seen in the center section, are interchangeable and are



Flasher for Large Theater Sign.

secured by only one screw, making it possible to install new sectors easily and introduce various changes in the flashing cycle.

Supplying Energy to a Municipal Plant Through a Simple Substation.

Transmission companies are succeeding in selling power to established municipal plants, whose cost of operation is often high. The particular outdoor substation shown in the accompanying illustration is serving a small city of approximately 5000 inhabitants. It has an initial capacity of 250 kilovolt-amperes, the voltage being stepped down from 44,000 to 2400, and distributed in the usual manner. As the load grows, the substation capacity can easily be increased by simply changing the transformers and primary fuses.

The three-phase, air-break switch is opened and closed by means of a manual remote-control mechanism, having a locking-type handle at the ground level. Lightning protection is secured by the use of high-power choke coils and automatic sphere-gap arresters. The carbon-tetrachloride fuses are so located that in case of transformer trouble or short circuit, the substation will be disconnected from the main line in approximately 0.027 second, thus preventing a local disturbance spreading to or affecting the main feeder.

This installation is of the "unit type," form VB, furnished by the Delta-Star Electric Company, Chicago, Ill.

Outdoor Substation Serving Municipal Plant.

A Line of Attractive But Not Expensive Fixtures.

The modern residence or apartment must have all its appointments designed for comfort and attractiveness so as to give it the restfulness and cheerfulness so necessary in our strenuous present-day life. Pleasing lighting fixtures are an essential part of the equipment for an attractive home. Such fixtures need not necessarily be very expensive, as is shown by the accompanying illustration. This is a simple and pleasing new design of shower fixtures made by the Art Metal Manufacturing Company, Sixty-first Street and Curtiss Avenue, Cleveland, Ohio. This company has devoted much effort

Pleasing Shower Fixture of Relatively Low Cost.

to the development of attractive fixture designs of all kinds and types and has perfected manufacturing methods for producing them at the lowest possible cost consistent with good quality. The design illustrated is but one of an extensive line that meets the several requirements of attractiveness, good lighting effect, high-grade material and workmanship, and relatively low cost.

The A. B. Wilson Company, Leader-News Building, Cleveland, O., is finding quite a marked demand for its new "Perfection" sectional screwless switch boxes, a description of which was published in our last issue. Electricians who have installed it are enthusiastic about its simplicity and adaptability. For the benefit of such electricians as may not at first grasp the idea of its design and use, the company is inclosing with each box a simple printed leaflet so that the workman will be quickly guided in the handling of this product. Copies of this leaflet are obtainable on application to the company.

Activities in the Trade

Doehler Die-casting Company, Brooklyn, N. Y., has entered suit in the United States District Court of New York (Brooklyn) against the Acme Die-casting Company, charging the latter company with infringment of the Doehler Die-casting Company's United States patent 1,156,073 for white-metal castings and method of making same.

National Metal Molding Company, Pittsburgh, Pa., has issued Bulletin No. 201, illustrating and describing its "Flexsteel" products, including armored cable and lamp cord, and flexible metallic conduit fittings; also "Flexsteel" panel-box connectors and flexible conduit couplings. This company has issued, also, Bulletin No. 400 on fixture studs of sherardized stamped steel. Each bulletin is sent out in a correspondence folder, suitably indexed for filing, a system the company recently inaugurated. Announcement is made of the issuance of other bulletins to be mailed to customers in folders, which have replaced the loose-leaf catalog formerly used.

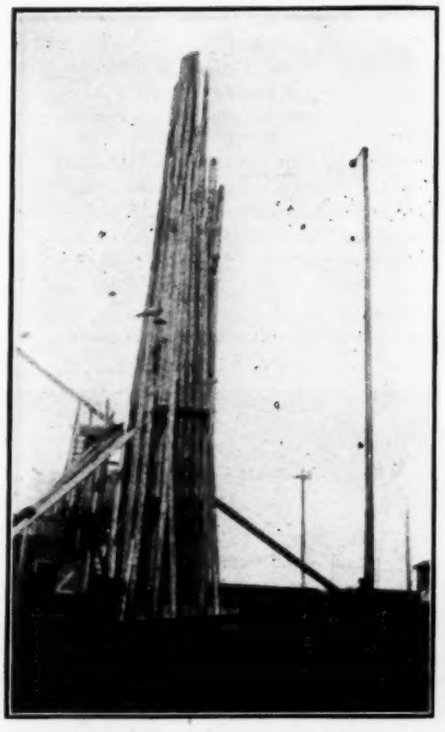
Electrification to the "Last Gasp."—Speaking before the Society for Electrical Development a few years ago, Henry L. Doherty made reference to the ultimate electrification of some typical industry to the "last gasp." The Crane Company's new plant at Chicago, Ill., which was described in our issues of January 22, 1916, and January 27, 1917, is perhaps the best example of a completely electrified industry in this country which comes under the classification expressed by Mr. Doherty. The General Electric Company, which supplied all of the electrical equipment for this plant, published an eight-page advertisement descriptive of this installation in our issue of May 26 which attracted such wide attention that it is being reprinted in other journals.

Hughes Electric Heating Company, Chicago, Ill., has issued a new booklet on electric cooking, entitled "What Every Kitchen Needs." The booklet contains an article by Good Housekeeping Institute on the new custom of cooking practically all foods in the electric oven—several at one time; the endorsement of electric cooking authorities; outlines many of the advantages of electric cooking and of the electric range; and gives a number of electric cooking recipes by Marion Harris Neil, former cookery editor of the *Ladies' Home Journal;* Janet McKenzie Hill, editor *American Cookery;* Mrs. E. K. Lemcke-Barkhausen, principal Greater New York Cooking School; Alice Bradley, principal Miss Farmer's School of Cookery of Boston, and Miss Mildred Maddocks of Good Housekeeping Institute. It will be sent gratis to anyone upon request.

Combustion Engineering Corporation, New York, has issued Bulletin B-2, dealing with its Type E Stoker, which is the underfeed type. It describes the method of feeding coal into the furnace from beneath the fire in such manner as to effect the distillation of the volatile matter from the coal, bringing about complete combustion of the gases thereby driven off. The mechanical features of this stoker are described, as is also the application of a volute fan to provide air for supporting combustion. The descriptive matter is accompanied by illustrations, one of which shows Type E stokers under 600-horsepower boilers. Complete elimination of smoke under varying rates of combustion is claimed to be effected by continuous feed and even distribution of coal made possible by this stoker. Incidentally, it is noted that this company has secured $6000 in subscriptions to the Liberty Loan by means of a special plan whereby the employees were able to purchase bonds through the company.

LeRoy Electric Porcelain Company, LeRoy, N. Y., will increase the capacity of its plant for the manufacture of electrical porcelain specialties. Four new kilns will be installed.

Western Red Cedar Poles Becoming Popular in the East.—The accompanying illustration shows a portion of the pole-treating plant of The Lindsley Brothers Company at Minneapolis, Minn. Of particular interest in this picture are two facts: First, the extreme height of the poles, which range from 55 to 80 feet; second, that they are being prepared for shipment to the East, where chestnut poles have heretofore been not only plentiful, but a great deal cheaper than western red cedar poles and therefore in much more general use. This particular batch of poles was given the



Treating the Butts of 55 to 80-Foot Cedar Poles at Lindsley Brothers' Minneapolis Yard for Shipment to Rhode Island.

"B" open-tank treatment in the company's large treating plant that was described in our issue of August 19, 1916. The poles were to be shipped to Rhode Island. Another important shipment of western red cedar poles is being made by the Lindsley organization to Brooklyn, N. Y., where about 1,000 such poles will be placed in service in the city streets. These shipments are examples of the increasing use of cedar poles in the East. One reason for this is that some time ago a so-called "chestnut blight" ruined the supply of good chestnut poles, so that now it is possible to secure only small, scrawny and very crooked poles of this species. Most municipalities in the East are legislating against their use along their streets. The higher first cost of the cedar poles is offset, however, by their much longer life, neater appearance and lower installation expense. There is every prospect, therefore, for much more general use of cedar poles in the eastern part of the country.

The Rutenber Electric Company, Marion, Ind., has appointed the Rumsey Electric Company of Philadelphia, as jobber in that territory. L. G. Poe, factory representative of the Rutenber Electric Company, rendered assistance to the Rumsey Company in introducing Rutenber products to central stations.

"Westinghouse Electrical Equipment for Ventilating Service" is the title of an attractive, profusely illustrated pamphlet just issued by the Westinghouse Electric & Manufacturing Company. The question of ventilating equipment for buildings is described in non-technical terms, and the characteristics of both the alternating and direct-current motors for this service are given in some detail. Data on the amount of power required to drive the different types of fans and blowers are also given. The illustrations cover a number of buildings in all parts of the United States which have been equipped with Westinghouse ventilating apparatus.

Westinghouse Machine and Electric Companies Merge.—At the annual meeting of the stockholders of the Westinghouse Electric & Manufacturing Company, held at East Pittsburgh, June 13, a vote taken on the proposed merger of the Westinghouse Machine Company with the Westinghouse Electric & Manufacturing Compay was unanimously in favor of the merger. The following directors whose terms expire this year were re-elected for four years: J. D. Callery, Paul D. Cravath, Harrison Nesbit, James N. Wallace. The stockholders of the Westinghouse Machine Company likewise voted in favor of this merger and authorized the directors and officers to arrange for same.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., devotes one of its June booklets to its magnetic separator pulleys, widely used in moving magnetic content from non-magnetic material. This includes removing pickheads, coupling pins and parts of other tools from coal as it passes to a crusher. For similar purposes they are used at phosphate rock quarries and metal mines. Attention is called to their use at sugar manufacturing plants, to remove iron rust from animal charcoal as it passes through ovens. The magnetic pulley is energized only about half of the time, that being sufficient to keep the iron oxide, or iron rust, out of the bone charcoal. In connection with coal pulverizing, magnetic separators are used at cement plants, in picking up metallic substances from the powdered coal as it passes to the rotary kilns. Their uses at gypsum plaster plants, ore-crushing plants, paper mills, chemical works and other factories are noted. This booklet contains much interesting matter.

Economy Fuse Employees 100 Per Cent for Liberty.—Every officer and employee of the Economy Fuse & Manufacturing Company, Chicago, has done his or her bit for liberty. Every name on the payroll stands for some personal service or personal sacrifice for the cause. Every member of the organization, numbering over 200, has purchased one or more Liberty bonds, from the officers and directors to the newest office boy. Some of the men and women have gone to the front in the army, the navy, the marines and in ambulance units. The stay-at-homes have responded to the government's appeal by subscribing a total of $80,000 worth of Liberty bonds. The company evolved a most liberal selling plan, based on weekly payments proportioned to the wage or salary of the individual. In some cases the payments are as low as 25 cents a week. In addition, the company will pay the last $5 of the purchase price as a bonus to the employee who remains in the company's employment the required length of time. It is provided that where an employee leaves the employ of the company before his subscription is entirely paid for, the money paid in will be refunded, together with six-per-cent interest. A. L. Eustice, president of the Economy Fuse & Manufacturing Company, expressed himself as being highly gratified with the success of the plan as it worked out in his plant. He said that, inasmuch as large quantities of the company's product are purchased by the government, he felt it to be a patriotic duty to have the company finance this method of giving all the employees an opportunity to invest in the Liberty loan.

View at Plant of Edison Storage Battery Company, Orange, N. J., During a Liberty Bond Rally. Employees Formed a Club, Which Held Meetings at Noon Every Day to Stimulate Enthusiasm in the Loan.

Personal and Biographical

JAMES G. WHITE, president of J. G. White & Company, Inc., of New York, N. Y., has been elected second vice-president of The Merchants' Association of New York.

P. B. RICE, electrical engineer of the United Gas & Electric Engineering Corporation, New York City, has been transferred to the International Railway, Buffalo, in the same capacity.

W. H. THOMPSON, formerly with the Central Union Telephone Company, Dayton, Ohio, recently became manager of the Middletown Telephone Company, Middletown, Ohio, succeeding J. A. Bell, resigned.

WILLIAM H. FETTER has been appointed manager of the Bell Telephone Company of Pennsylvania, Harrisburg, to succeed Edmund W. Gilpin, who has become a member of the First Cavalry, State National Guard.

A. G. CARSON, recently appointed manager for the Eastern Wisconsin Electric Company, Fond du Lac, Wis., has had wide experience in the service of electric companies. He was formerly chief engineer for the Winnebago Traction Company, Oshkosh; and when the latter company was consolidated with the Eastern Wisconsin Railway & Light Company, he assumed the duties as superintendent, which position he filled about eight years.

C. A. GATES, general manager of the Southwestern Telegraph & Telephone Company, has been promoted to vice-president of the company and made consulting engineer for the Southwestern Bell System, with headquarters at Dallas and St. Louis. Mr. Gates has been in the service of the Bell System for thirty-two years, and has risen from an unimportant position to his present one by ability and perseverance. He came to Texas in 1910 and is well known over the state.

SAMUEL INSULL, president of the Commonwealth Edison Company, Chicago, Ill., has been given the degree of Doctor of Science by the Union College, of Schenectady, N. Y., in recognition of labors in the development of electrical science. Mr. Insull was at one time employed by the General Electric Company at Schenectady and in his presentation speech President Richmond, of Union College, referred to Mr. Insull as "establishing in Schenectady a vast industry."

MAJ. PETER JUNKERSFELD, in private life assistant to the vice-president of the Commonwealth Edison Company, Chicago, Ill., answered the call to the colors on June 14, when, in response to an order from the Secretary of War, he left for Washington. Major Junkersfeld will be assigned to duty in connection with cantonment construction. A number of employees escorted Major Junkersfeld to the train and just before departure presented him with a watch as a token of their good wishes for his success and a safe return.

R. E. UPTEGRAFF has accepted a position as designing engineer in the transformer department of the Packard Electric Company of Warren, O. Mr. Uptegraff's practical experience in the electrical field consists of a four years' apprenticeship course with the Westinghouse Electric & Manufacturing Company. After completing the apprentice work he entered the power engineering department and one year in the transformer engineering department. He resigned from the Westinghouse company to accept the position as assistant chief designing engineer for the Pittsburgh Transformer Company, remaining in its employ five and one-half years. Recently he resigned from the Pittsburgh company to accept half interest in the B. Rutherford Company (consulting engineering) of Pittsburgh, Pa., which work will be carried on in addition to his work with the Packard Electric Company.

GEORGE H. STICKNEY, who has just been elected president of the Illuminating Engineering Society, is one of its oldest and most active members. He was a charter member at the time of

Georeg H. Stickney.

organization in 1906 and served during the first year as secretary of the Society's New England Section. In 1911 he was chosen chairman of the New York Section and re-elected the following year. In 1913 he became vice-president for two years and during the last year he has served as general secretary of the society. He has also been active on its various committees and for the last three years has been chairman of the important Committee on Papers. Mr. Stickney was born in Buffalo, N. Y., in 1872. In 1896 he was graduated from Cornell University with the degree M. E., and on July 1 of that year entered the employ of the General Electric Company, with which he has remained continuously. For a year and a half he took the student course at the Schenectady Works. Then he was transferred to the Lynn Works, where for 11 years he was first assistant to W. D'Arcy Ryan, illuminating engineer. During this period he first took up factory and commercial engineering work on arc lamps; later, as the high-efficiency Mazda lamps were brought out, he took up similar work with incandescent lamp equipment. In 1909 he and Mr. Ryan were transferred to the Schenectady Works, where he remained for two years closely associated with Mr. Ryan in important work. In May, 1911, Mr. Stickney went to the Harrison Works (now Edison Lamp Works), taking charge of the illuminating engineering work with the title assistant to the sales manager. Mr. Stickney has developed quite a number of lighting appliances and collaborated on the design of many more. He has written many company publications, also general articles and papers dealing with illumination. He has served on many committees in different societies interested in illumination. Aside from his connection with the Illuminating Engineering Society, Mr. Stickney is a member of the American Institute of Electrical Engineers, the National Electric Light Association, the American Association for the Advancement of Science, Association of Iron and Steel Electrical Engineers, Association of Railway Electrical Engineers, American Museum of Safety, Engineers' Club of New York, etc.

JAMES T. HUTCHINGS, general manager of the Rochester (N. Y.) Railway & Light Company has been appointed vice-president of the company. He will also continue in the capacity of general manager, which position he has held since 1909. Mr. Hutchings was graduated from the Massachusetts Agricultural College at Amherst, Mass., and immediately after entered the employ of the Thomson-Houston Electric Company where he worked for six months, installing an electric plant at Amherst. In November, 1889, he went with the Germantown Electric Light Company as assistant superintendent, remaining until April, 1891, when he resigned to go with the West End Electric Company of Philadelphia as assistant superintendent. In 1893 upon the consolidation of this company with other electric companies into the Philadelphia Electric Company, he was appointed superintendent. Mr. Hutchings held the position of assistant electrical engineer with the Philadelphia Electric Company until June, 1904, when he accepted the position of superintendent of the Electrical Department of the Rochester Railway & Light Company. In 1909 he was made general manager of the company and his recent promotion to become vice-president and general manager took place June 1, 1917. Mr. Hutchings has been largely instrumental in building up the Rochester Railway & Light Company to the enviable position which it now occupies. He has personally studied and developed the present company organization, and given to it a comprehensive knowledge of finance, business and engineering.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

NEWPORT, R. I.—The Bureau of Yards and Docks, Washington, D. C., will install new equipment at the power plant of the local naval training station, consisting of turbo-alternators, boilers, stokers, exciters and draft fans. Bids have been received.

OSWEGO, N. Y.—The breaking of an iron pulley, about 12 feet in diameter, operating on the waterwheel shaft at the power plant of the People's Gas & Electric Company, June 11, wrecked a portion of the building. The damage to structure and equipment will be immediately repaired.

KEANSBURG, N. J.—The New York Telephone Company has completed what is said to be the largest telephone submarine cable line, under Raritan Bay, between Keansburg and Staten Island, about five and one-half miles. The cable is of duplex type, with seventy-four pairs of transmission wires and twelve pairs of testing wires. The installation will allow the removal of considerable aerial line from Red Bank north.

NEWARK, N. J.—The Board of Freeholders has approved a bond issue of $25,000 for additional improvements and extensions at the power plant of Overbrook Hospital. This will make a total of about $190,000 for the work.

NEWARK, N. J.—The new power extension to be constructed by the Public Service Electric Company at its Essex station will be three-story, about 90 by 165 feet, with six-story, reinforced-concrete switch house, 37 by 65 feet. The complete plant will cost $365,000.

PATERSON, N. J.—The Board of Public Works has commenced the installation of a new police and fire telegraph system. The work will include new underground lines, signal boxes and receiving cabinets. James F. Zeliff is superintendent in charge.

ROCKAWAY, N. J.—In accordance with the Borough Council's ruling that no more water could be used for power at local manufacturing plants, plans are being made by the different companies affected to install electric motors for operation. The New Jersey Power & Light Company, Dover, furnishes light and power in this section.

ROSELAND, N. J.—The Borough Council (Committee on Street Lighting) will receive bids until 8 p. m., July 13, for furnishing street-lighting service for a period of five years, with 32-candlepower lamps.

SOUTH AMBOY, N. J.—The Jersey Central Traction Company received a franchise from the city council to construct and operate an electric railway in South Amboy. Address T. W. Wilson, 603 Market Street, Wilmington, Del., general manager.

WRIGHTSTOWN, N. J.—Active work is being commenced on the construction of the local cantonment for the United States Army. The camp with necessary equipment is estimated to cost $5,000,000. The work will include an electric lighting system; the Delaware & Atlantic Telephone Company has commenced the construction of new trunk lines from Trenton to Mt. Holly for service at the camp. The local station will include about ten switchboards and 1,000 instruments.

CHESTER, PA.—The Seaboard Steel Casting Company is reported to be planning for the erection of a new power plant in connection with a proposed extension to its foundry. The American Locomotive Company recently acquired this property.

HARRISBURG, PA.—The Postal Telegraph-Cable Company and Western Union Telegraph Company are considering a joint underground conduit system in the central business district, to allow for the elimination of the present overhead lines.

PHILADELPHIA, PA.—The Penn Chemical Company will build a new one-story power house addition to its plant in connection with a new factory to cost about $75,000. Contract for erection has been awarded.

PHILADELPHIA, PA.—A one-story engine room addition will be erected at the power plant of Baugh & Sons Company, 20 South Delaware Avenue, manufacturer of oils. The structure will be on the Morris Street wharf.

PHILADELPHIA, PA.—The Philadelphia Electric Company has taken bids for the erection of the proposed one-story addition, about 30 by 50 feet, to its station at Schuykill Avenue and Christian Street.

PHILADELPHIA, PA.—The Bureau of Yards and Docks, Washington, D. C., has awarded a contract to the M. J. Roche Construction Company, Johnson Building, Cincinnati, O., for the construction of a reinforced-concrete power plant, about 100 by 260 feet, at the League Island Navy Yard. The same company has also received the contract for the erection of a similar station at Norfolk.

READING, PA.—The Blue Mountain, Mt. Aetna, Marion, Union, Bethel and Bunker Hill Electric companies have been merged into one company to operate throughout the Bethel district.

SEAFORD, DEL.—The Sussex Gas Company is planning to close its local plant on July 1 for the installation of new machinery.

BALTIMORE, MD. (Westport).—Plans for another substation for the Consolidated Gas, Electric Light & Power Company at Westport are being prepared by the company's engineers, and it is expected that work on the new unit, to be known as Station D, will be started as soon as Station C is completed.

CHARLESTON, W. VA.—The Farmers' Union Telephone Company, operating in Monroe and Greenbrier Counties, has made application to the Public Service Commission for permission to increase its rates 33⅓ per cent a month to stockholders, or a total of 50 cents, and from 50 to 75 cents a month for all other subscribers.

CHARLOTTE, N. C.—The Western Carolina Power Company is planning for the construction of a new 25,000-kilovolt-ampere generating station at Bridgewater and a 70,000-kilovolt-ampere plant at Camden, N. C. New transmission lines will be constructed to tie the plants in with the main system. The company has recently increased its capital to $4,500,000 to provide for these and other extensions.

COLUMBIA, S. C.—The Columbia Railway Gas & Electric Company plans extension to prospective U. S. Army camp, east of Columbia, between 5 and 10 miles long. A. L. Kenyon, Arcade Building, Columbia, is manager.

NORTH CENTRAL STATES.

DAYTON, O.—Erection of a modern power building at an approximate cost of $250,000 has been announced by H. E. Talbott. The new building will be erected upon a foundation measuring 60 by 180 feet. It will be a seven-story building of modern fireproof construction.

YOUNGSTOWN, O.—The Youngstown & Niles Railroad Company, which is promoting the new street-car line between Youngstown and Niles to extend through the new town of McDonald, has asked the Ohio Public Utilities Commission for authority to issue $37,500 of bonds.

WENONA, ILL.—A. B. Kipp & Company of Minonk have been awarded the contract for building the new telephone exchange building at Wenona, which is to cost between $10,000 and $12,000. The building will be a fireproof structure and will contain a switchboard and other equipment.

BOYNE CITY, MICH.—The State Railroad Commission authorized the Boyne City, Gaylord and Alpena Railroad Company to issue bonds amounting to $800,000 in order to complete the road, purchase new equipment and discharge obligations incurred by the receivers. Nine miles of track between Atlanta and Alpena must be constructed before cars can be operated over the entire line from Boyne City to Alpena, a distance of 97 miles. Address Receiver.

BAYFIELD, WIS.—Plans are forming to establish a white way on Rittenhouse Avenue, at an estimated cost of $800.

BERNHAMWOOD, WIS.—The Charles W. Fish Lumber Company will erect a power plant and install a steam-generating equipment. Address general manager.

EAU CLAIRE, WIS.—The Wisconsin-Minnesota Light & Power Company is improving its light plant. A. R. Manley, manager.

FLORENCE, WIS.—The Peninsula Power Company of Chicago, Ill., has selected a site for the proposed hydroelectric power plant. Address Max Sells of Florence.

GLENWOOD CITY, WIS.—The stock of the Glenwood & Downing Light & Power Company has been transferred to the Wisconsin-Minnesota Light & Power Company, but the local management of the plant will remain unchanged and the business will continue to be conducted under the corporate name of the Glenwood & Downing Light & Power Company. The building next to the First State Bank has been rented as an office and display room. Work is going along on the Boyceville extension of the local system, and service will be inaugurated soon.

GRAND RAPIDS, WIS.—Bids were received June 20 for the white way. A. T. Thompson, city engineer, is revising plans. Joseph Wheir, clerk. $9,000 will be expended.

MADISON, WIS.—Peninsular Power Company has applied for an amendment increasing common stock from $750,000 to $1,000,000 and preferred stock $1,000,000 to $2,000,000. This company has a dam in the Brule River and hydroelectric plant three miles from Florence, which is to furnish electric current over a wide area of territory in the north. The principal officers are: President, O. C. Davidson, Iron Mountain, Mich.; vice-president, C. V. Seaton, Madison; secretary, F. E. Turneaure, Madison.

MADISON, WIS.—To prevent congestion, the Wisconsin Telephone Company is constructing a new line between Madison and Tomah. The increase in business at Camp Douglas is responsible for the project.

POLAR, WIS.—Polar Telephone Company with an initial membership of 42 subscribers was organized at Polar. Walter J. Gallon of the Antigo Telephone Corporation was present and submitted a proposition whereby the subscribers in the new company will get direct connections with the Antigo exchange. At present it is necessary to call the Polar exchange and pay a toll charge which will be unnecessary in the future. The new company will run wires toward Antigo as far as the Ogden corners, using the toll line poles of the Antigo Company. The toll line will continue to be an independent circuit.

PRENTICE, WIS.—At the annual meeting of the Mutual Telephone Company it was decided to improve and extend lines. Address J. A. Morner, president.

SEYMOUR, WIS.—The Seymour Electric Company, recently incorporated, will erect an electric light and power plant. Address E. P. Daniels.

SHAWNO, WIS.—The electric light and water commissioners recommend improvements to be made to the municipal

light and water system. Address city engineer.

SHEBOYGAN, WIS.—The Eastern Wisconsin Electric Company will build an addition to its power house.

TOMAH, WIS.—City Council has closed a contract with Wisconsin-Minnesota Light & Power Company for street lighting service for five years. The company is to install 90 bracket lamps, each of 100-candle-power. The service cost is $2,900 per year. The company has also submitted a proposal to pump the city's water supply by electric power.

WAUPACA, WIS.—Wisconsin Telephone Company has lately spent $35,000 in constructing a new exchange, $27,000 on its outside plant, and $8,000 on central-office equipment.

WAUPACA, WIS.—Application has been made to the state legislature for appropriation of $60,000 for a power plant at Wisconsin Veterans' Home. Address the superintendent.

MONTEVIDEO, MINN.—The Northwestern Telephone Company has purchased a site and will build a central office, to cost $35,000.

CLERMONT, IA.—The Northeastern Iowa Power Company has been incorporated by C. Miller & Sons of Clermont, who have been operating under the Turkey River Power Company. The new company will take over the electric light and power system that serves 18 towns, and this will be extended.

DES MOINES, IA.—Applications were made to the State Board of Railway Commissioners for franchises for high-tension electric transmission lines as follows: Iowa Southern Utilities Company of Centerville; line in Ringgold County; Iowa Light, Heat & Power Company of Grinnell; line from Carroll to Auburn and Lake City; Cedar Valley Hydraulic Company, Waterloo; line in Franklin County from Hampton to Cerro Gordo County line; also from Waterloo to Cedar Falls and Parkersburg; Commonwealth Utilities Company, Mankato, Minn.; line from Armstrong to Ledyard and Fenton; also from Germania to Buffalo Center, Thompson and Lake Mills; also from the Minnesota line to Germania, Bancroft and Titonka.

FT. DODGE, IA.—The contract for building the power transmission line from the municipal dam to the city water works has been awarded to the McGraw Electrical Construction Company of Omaha. The amount of the contract was $2,313.

KEOKUK, IA.—The Keokuk Electric Company is planning to rebuild its trolley and power-transmission line between Hamilton and Warsaw. New poles and equipment have been ordered for this work, which will start as soon as the new transmission line to Montrose is completed. The old wires will be restrung on new poles. The distance between the two points is five miles.

NORTHWOOD, IA.—The Northwood Telephone Company has been purchased by the Western Electric Company of Mason City. A toll center will be established at Northwood and other improvements made. Address B. C. Way, Mason City.

WEBSTER CITY, IA.—The Iowa Telephone Company has purchased the Farmers & Merchants Telephone Company of this city. Along with the Webster City plant, the Farmers and Merchants Company also sold all its other plants to the Iowa company. The former concern owned some 35 plants over northwest Iowa, all of which are now in possession of the Iowa Telephone Company.

CANTON, MO.—A special election will be held June 26 to vote on the proposition of issuing $15,000 in bonds for making an extension of the watermains, building a sea wall to protect the power house and to erect a white way.

CARTHAGE, MO.—Consolidation of the two telephone systems is the method recommended by the committee recently appointed, for getting better service, and this is being considered.

KANSAS CITY, MO.—The Kansas City railways are removing their iron poles on McGee Street, from Fifteenth to Nineteenth Streets, which support electric lights, and a movement has been started for the installation of ornamental bracket lights.

KIRKSVILLE, MO.—The City Commissioners have appointed a committee to see what could be done relative to the installation and maintenance of street lights.

DATES AHEAD.

American Institute of Electrical Engineers. Annual convention, New York, N. Y., June 27-28. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

National Electrical Credit Association. Annual meeting, Boston City Club, Boston, Mass., June 28-29. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

ARMA, KANS.—The municipal light plant is to be closed and power for city lighting is to be furnished by the Kansas Gas & Electric Company.

BEATTIE, KANS.—Daniel Hockman, owner and manager of the local light plant, has made plans for the expenditure of several thousand dollars for improvements, to be completed by August 15.

COFFEYVILLE, KANS.—The City Council has bought property on which it will erect an electric light plant.

EL DORADO, KANS.—The Southwestern Bell Telephone Company, with headquarters at Wichita, has begun the installation of an $85,000 system in El Dorado.

KANSAS CITY, KANS.—The City Commissioners have decided to do away with arc lights and will substitute incandescent lights of 250, 400 and 600 watts each.

LAWRENCE, KANS.—The consolidation of the Bell and Home Telephone Companies will be effected by the first of September, if the present plans are not further hindered by the inability to get materials.

LEONORA, KANS.—An election will be held June 27 to vote $10,000 in bonds for a new electric lighting system. C. W. Tuma is city clerk.

WHITEWATER, KANS.—Pending the completion of the transmission lines of the Kansas Gas & Electric Company from Wichita, the city is now getting power from the local mill. When the line is in service the mill will install a motor to supply its own power.

OMAHA, NEB.—The Omaha Electric Light & Power Company has been purchased by the Nebraska Power Company. The power plant has recently been enlarged by the installation of a new steam turbine, giving it a total generating capacity of 44,000 horsepower. The plan is to extend lines to develop territory beyond the limits of Omaha. Its policy will be guided by the following Omaha men, who are officers and directors: George H. Harries, president; William D. McHugh, vice-president and general counsel; Ward M. Burgess, vice-president; J. E. Davidson, vice-presdent and general manager; S. E. Schweitzer, secretary and treasurer; T. C. Byrne, Gould Dietz, G. W. Holdrege, Joseph E. Barker, Senator J. H. Millard and C. E. Yost.

FORBES, N. D.—Plans are being considered for the installation of a municipal light plant extending lines from Ellendale to Forbes.

OMEMEE, N. D.—Omemee is planning to install a modern electric light plant in the near future.

PARSHALL, N. D.—The North Dakota Independent Telephone Company through F. L. Shuman is negotiating for the purchase of the local exchange. Special toll lines are promised between this city and Stanley.

SOUTH CENTRAL STATES.

HAZARD, KY.—The Kentucky River Power Company is paying attention to illumination of the town's business district. Merchants have been induced to make use of big lamps and to use electric signs. The company is installing a large sign on the top of the city's hotel and General Manager Cornell has provided reflector lamps to illuminate the flag on the courthouse at night. One of the new turbines purchased for the plant of the company has arrived and is being installed.

SEBREE, KY.—The New Sebree Light & Power Company, with capital of $8,100, has been incorporated by Henry Powell, J. J. Korb and D. W. McMullen.

FAYETTEVILLE, TENN.—A charter has been issued to the Fayetteville Electric Light & Power Company, recently organized with capitalization of $60,000, by H. K. Bryson, W. J. Burns, W. M. Smith and others.

PARIS, ARK.—The Electric Light Improvement District has been organized to build an electric light and power plant. Bids will be received June 29 for building and equipment. Address W. N. Gladson, Fayetteville, Ark.

NEW ORLEANS, LA.—The Elysian Fields Avenue Commission is making plans for an electric car line in Elysian Fields, from the river to Milneburg. P. G. Charbonnett, president.

COLGATE, OKLA.—The electric light plant was put out of commission by the recent storm. The pumping station of the city waterworks was destroyed and the city is now without either water or light.

GATE, OKLA.—This city voted in favor of granting a franchise to E. G. Pickett to install an electric light and power plant.

PICHER, OKLA.—The city authorities are planning to place twenty-five lights on the city street.

TEMPLE, OKLA.—An election will be held July 13 to submit to the voters the proposition of granting a franchise to J. C. Keys, of Lawton, for natural gas and electric light.

OKLAHOMA CITY, OKLA.—The white way installed at Oklahoma City last year will be largely extended if present plans are realized. Fifty property owners on Broadway from Grand Avenue to Seventh Street have signed contracts for their part of the agreement and it is expected that the remaining owners will be secured within a week. Under this arrangement the city pays for the current used, the property owners make the installation and the Oklahoma Gas & Electric Company furnishes current.

BEAUMONT, TEX.—The Bell Telephone & Telegraph Company has been incorporated and will build an exchange to cost $150,000. Address J. E. Farnsworth, manager.

DEL RIO, TEX.—The Del Rio & Western Telephone Company has increased its capital from $100,000 to $200,000.

ROSENBERG, TEX.—Fort Bend Telephone Company has been chartered with a capital stock of $30,000.

SHERMAN, TEX.—The two telephone companies of this city merged on June 9 and all the local business will be taken over by the Grayson Telephone Company.

SAN ANTONIO, TEX.—The South Texas Telegraph & Telephone Company has prepared plans and shortly will begin construction of a new exchange in San Antonio. The new institution will represent an investment of over $40,000. The switchboard will accommodate 10,000 telephones. The company is preparing to install a big exchange at Fort Sam Houston, to include 750 direct telephones to all the department headquarters. Camp Wilson, Leon Springs, Aviation Camp and sub-divisions of these departments. The installation of this new exchange will mean the addition of at least another 500 telephones for private and commercial use outside of the army exchange. Address C. A. Gates, general manager, National Bank Building, Dallas.

SHERMAN, TEX.—Grayson Telephone Company of this city has taken over all local telephone business in Sherman, effecting a consolidation with the Southwestern Telegraph & Telephone Company, which retains its long-distance franchise. C. A. Shock of this city is at the head of the Grayson Telephone Company.

TOMBALL, TEX.—Tomball Telephone Company has been incorporated here. Capital stock, $5,000. Incorporators: A. C. Christian, William Holderrieth, C. F. Hoffman and others.

WESTERN STATES.

HARLEM, MONT.—The Citizens Electric Company has been formed and will establish a light plant here. Ten thousand dollars already has been subscribed. Address J. M. Rantschler, president.

RESERVE, MONT.—The Reserve Commercial Club called a meeting June 20 for the purpose of organizing a telephone company, which will run a line from Reserve to Dagmar along the star mail route. Address secretary of the Commercial Club.

WESTBY, MONT.—At a meeting of the Westby Commercial Club the Westby Telephone Company was organized with a capital of $10,000. John D. Borg, president.

ALBUQUERQUE, N. M.—The Albuquerque Gas & Electric Company has been incorporated and has acquired all the properties and franchises of the Albuquerque Gas, Electric Light & Power Company, and the Albuquerque Electric Power Company, and will continue all the business previously carried on by the two latter companies in the city of Albuquerque. All the capital stock of the new company has been acquired by the Federal Light & Traction Company. Address John B. Marsh, Broadway, New York, N. Y.

MESA, ARIZ.—On June 30 this city is to sell electric lighting plant bonds to the amount of $125,000.

WINSLOW, ARIZ.—The Winslow telephone system has been sold to W. C. Cooley, who expects to expend several thousand dollars on improvements.

SALT LAKE CITY, UTAH.—Electrification of the Saltair, Garfield & Western Railroad will start soon, the company having $50,000 on hand for the work.

SALT LAKE CITY, UTAH.—Plans have been drawn and surveys made for a modern hydroelectric plant and a storage reservoir in Red Butte Canyon. The estimated cost is from $100,000 to $125,000.

NORTH YAKIMA, WASH.—The Woodhouse Telephone Company has applied for a franchise to construct a telephone line on certain county roads.

OKANOGAN, WASH.—The Okanogan Valley Power Company will rebuild its lines within the limits of the city.

SEATTLE, WASH.—The city is to build the municipal car line to the Todd Shipbuilding plant by August 15, providing the city can procure the equipment.

TACOMA, WASH.—Bids are being received for furnishing the city with two lighting feeder panels with their equipment, for installation in the city's substation. Bids will also be accepted for the following as a whole or in separate items: Switchboard material, voltage regulators, disconnecting switches, oil circuit-breakers, insulated cables, fiber, copper and bar copper.

COQUILLE, ORE.—The Oregon Power Company expects to construct a power line from Marshfield to this city, at an estimated cost of about $25,000.

EUGENE, ORE.—An electric lighting plant has been put in by the Buck Shingle Mill Company near this place.

MARSHFIELD, ORE.—It is announced by A. L. Martin, manager of the Oregon Power Company, that construction of the high-tension line to carry current from Smith mills to Coquille and Myrtle Point will be started at once, same to cost about $25,000.

TOLEDO, ORE.—The Pacific Telephone & Telegraph Company is planning the standardizing of its equipment within the next 60 days. The cost will be about $10,000.

BRAWLEY, CAL.—It is reported that a survey is being made by the Pacific Telephone & Telegraph Company for the connection of the Imperial Valley with San Diego by a long-distance telephone.

FRESNO, CAL.—An appropriation of nearly $50,000 has been made by the Pacific Telephone & Telegraph Company for improvements in this district.

LOS ANGELES, CAL.—The Beverly Hills Utilities Company, Los Angeles County, has been authorized to sell its electric system and properties to the Southern California Edison Company for $23,347.

LOS ANGELES, CAL.—The Little Grant Heating & Lighting Company has been incorporated for $100,000 by S. V. Halstead, D. S. Collins, A. L. Davidson, G. H. Reimer and J. R. Edwards.

RIVERSIDE, CAL.—A contract has been let to D. A. Tamplin for $1,925 for the installation of an ornamental lighting system, on Main Street, extending over four blocks.

SAN DIEGO, CAL.—The sum of $600,000 has been appropriated for the construction of a lighting system and other improvements on a site to be used for a marine brigade post.

SAN FRANCISCO.—The San Jose Railroads and the Peninsular Railway Company have filed an application with the California State Railroad Commission for authority to sell to the Pacific Gas & Electric Company for $68,900 a transmission line between San Jose and Saratoga, Cal.

SAN FRANCISCO.—Bids have been called for the furnishing and installing of electric lighting fixtures in Engine House No. 37.

SAN FRANCISCO.—The Pacific Gas & Electric Company has the big Pit River development under way; two hydroelectric plants, one at either end of the proposed tunnel, are to be installed to furnish power for construction work.

SAN FRANCISCO.—The Pacific Gas & Electric Company is to install an additional power house about 600 feet below the Spaulding Dam, where 5,000 horsepower will be generated under a 173-foot head of water. It will cost about $125,000.

STOCKTON, CAL.—The Pacific Telephone & Telegraph Company has been granted a 25-year franchise by the City Council. For this franchise the company pays the city $100 and two per cent of the gross annual receipts. Twenty-five main line telephones and 12 extensions are furnished to the city free of cost.

PROPOSALS

ELECTRIC CABLE.—Sealed bids will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, June 26, for furnishing and delivering to the City of Chicago, department of Gas and Electricity, fire-alarm cable, electric light cable and subway type series transformers strictly in accordance with specifications on file and in the following approximate amounts: 10,560 feet 15-pair, No. 19 B. & S. angle paper-insulated, lead-covered fire-alarm cable; 2,000 feet, 50-pair, No. 19 B & S. paper-insulated, lead-covered fire-alarm cable; 4,000 feet type R. D. 2,500-volt duplex, No. 8 B. & S. stranded rubber-insulated S. D. tinned copper wire; 116,000 feet of eight-conductor paper-insulated, lead-covered No. 8 B. & S. 5,000-volt cable; 54,000 feet four-conductor, paper-insulated, lead-covered No. 8 B. & S. 12,000-volt cable; 24,500 feet three-conductor, paper-insulated, lead-covered No. 2 B. & S. 12,000-volt cable; 500 subway-type series transformers. Proposals must be made out upon blanks furnished by the Commissioner of Gas and Electricity. Address William G. Keith, Commissioner of Gas and Electricity, Chicago, Ill.

MOTOR-DRIVEN MACHINERY.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for the following motor-driven machinery at early dates not yet specified. Intending bidders should apply promptly to the Bureau for copies of the schedules mentioned. One 24-inch upright drill, one grindstone, one back-geared screw-cutting tool-room lathe, one variable-speed milling machine, for delivery at Brooklyn, N. Y., schedule No. 1244; 11 triple-geared 36-inch by 20-foot lathes, four 24-inch heavy-duty turret machines, Charles Town, W. Va., schedule No. 1252; one milling machine, Washington, D. C., schedule No. 1242.

FINANCIAL NOTES

American Public Utilities Company has declared its regular quarterly dividend of 1½% on preferred stock, payable July 2 on stock of record June 2. Power demands on Wissota dam plant are reported to be the heaviest in the history of the company. These demands come mostly from the cities of Minneapolis and St. Paul, and from towns in northern Minnesota.

Illinois Traction Company reports income account for the year ended December 31, 1916, from which the following is taken: Gross earnings, $12,566,447, showing an increase of $1,378,452 over those of 1915. Expenses and taxes, $7,489,779, an increase of $883,228 over those of 1915. Net earnings, $5,076,649, an increase of $546,223 over net earnings of 1915.

The City Electric Company, San Francisco, Cal., has reported to the California Railroad Commission the following figures: Total fixed capital, $9,463,473.44;

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRIC COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate per cent.	Bid June12.	Bid June19.
Adirondack Electric Power of Glens Falls, common	..	20	20
Adirondack Electric Power of Glens Falls, preferred	6	75	75
American Gas & Electric of New York, common	10+extra	120	120
American Gas & Electric of New York, preferred	6	48	48
American Light & Traction of New York, common	..	329	329
American Light & Traction of New York, preferred	6	110	110
American Power & Light of New York, common	4	66	66
American Power & Light of New York, preferred	6	88	88
American Public Utilities of Grand Rapids, common	..	28	28
American Public Utilities of Grand Rapids, preferred	6	64	64
American Telephone & Telegraph of New York	..	121⅝	121⅝
American Water Works & Elec. of New York, common	..	7	7
American Water Works & Elec. of New York, particip	7	22	23
American Water Works & Elec. of New York, first preferred	..	75	75
Appalachian Power of Bluefield, common	..	5	5
Appalachian Power of Bluefield, preferred	7	30	30
Cities Service of New York, common	6+extra	283	283
Cities Service of New York, preferred	6	84½	85
Commonwealth Edison of Chicago	8	122	122
Comm. Power, Railway & Light of Jackson, common	4	48	48
Comm. Power, Railway & Light of Jackson, preferred	6	74	74
Federal Light & Traction of New York, common	..	10	10
Federal Light & Traction of New York, preferred	..	42	42
Illinois Northern Utilities of Dixon	6	78	78
Middle West Utilities of Chicago, common	2+2 extra	42	43
Middle West Utilities of Chicago, preferred	6	68	70
Northern States Power of Chicago, common	7	96	97
Northern States Power of Chicago, preferred	7	97	100
Pacific Gas & Electric of San Francisco, common	5	59	59
Pacific Gas & Electric of San Francisco, preferred	6	89	89
Public Service of Northern Illinois, Chicago, common	7	92¼	92¼
Public Service of Northern Illinois, Chicago, preferred	6	97	97
Republic Railway & Light of Youngstown, common	4	30¾	30¾
Republic Railway & Light of Youngstown, preferred	6	64½	64½
Standard Gas & Electric of Chicago, common	..	11	12
Standard Gas & Electric of Chicago, preferred	6	35	36
Tennessee Railway, Light & Power of Chattanooga, common	..	5½	5½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	25	25
United Light & Railways of Grand Rapids, common	4	38	39
United Light & Railways of Grand Rapids, preferred	6	68	68
Western Power of San Francisco, common	..	14½	14½
Western Power of San Francisco, preferred	6	52	52
Western Union Telegraph of New York	extra	93½	93½
Industrials—			
Electric Storage Battery of Philadelphia, common	4	62⅞	62⅞
General Electric of Schenectady	8	162	162
National Carbon of Cleveland, common	8	*75	*75
National Carbon of Cleveland, preferred	7	*133	*133
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	53½	53½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	68½	68½

*Last sale.

total assets, $10,004,697.26. Capital stock, $5,000,000; funded debt, $2,701,000. Income account December 31, 1916: Operating revenue, $1,531,714.25; operating expenses, $1,233,851.19; net operating revenue, $297,863.06; non-operating revenue, $3,261; gross corporate income, $301,-124.35.

The Great Western Power Company, operating in San Mateo County, reports to the California Railroad Commission the following figures: Total fixed capital, $115,206.02; cash and deposits, $357,294.56; investments, $32,196,900; total assets, $33,-212,075.44; capital stock, $27,500,000; funded debt, $5,000,000. Income account December 31, 1916: Operating revenue, $5,312.19; operating expenses, $5,301.95; net operating revenue, $10.24; non-operating revenue, $536,009.42; gross corporate income, $536,019.66; total deductions, $283,412.81; net corporate income for year, $252,605.85; dividends, $275,000; deficit on December 31, 1916, $41,254.83.

The California Railroad Commission has authorized J. W. Cain and Albert Cain, owners of the Novato Light & Power Company, Novato, Cal., to sell to the Novato Utilities Company telephone, electric and water distributing properties in Novato and the surrounding territory now owned by the former company. The purchase price will be $20,000 in the stock of the purchasing company.

Eastern Texas Electric Company has declared the regular semi-annual dividends of $3 a share on the preferred and $2.50 a share on the common stock, payable July 2 to stock of record June 16.

United Traction & Electric Company has declared the regular quarterly dividend of 1¼ per cent on its capital stock, payable July 2 to stock of record June 12.

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

Pacific Gas & Electric Company reports earnings for the four months ended April 30 and for the month of April, as follows:

	1917.	1916.
Four months gross	$6,724,271	$6,534,964
Net after charges	1,294,377	1,590,829
Balance after preferred dividends	800,321	1,138,800
April gross	1,644,164	1,515,596
Net after charges	313,187	312,147
Balance after preferred dividends	189,627	198,363

Gross of the Pacific Gas & Electric Company for the year ended April 30, 1917, was the largest in the company's history. With $6,724,271 gross for the four months ended April 30, 1917, an increase of $180,306 over 1916, the company demonstrated its ability to expand its sales in an energetic manner. The company now has at this time a connected load of 75,000 horsepower greater than in the corresponding period of last year and new business is being added at the rate of about 7,000 horsepower a month.

MONTANA POWER.

Earnings of Montana Power Company for the four months ended April 30, 1917, as filed with the New York Stock Exchange, are as follows:

Gross earnings	$2,485,440
Operating expenses and taxes	615,122
Net earnings	$1,870,318
Other income	1,334
Net income	$1,871,652
Interest on bonds	471,841
Bond discount	33,280
Interest on floating debt	7,744
	$512,866
Loss: Charged to construction	58,336
	$454,530
Surplus income for four months	$1,417,121

Electrical Patents Issued June 12, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,229,211. Combination Lock and Switch. B. L. Beckner, assignor one-third to H. Witt and one-third to F. H. Schlater, Anderson, Ind. Device having switch operation controlled by permutation plate.

1,229,225. Control Mechanism for Charging and Discharging Machines. H. A. Carpenter and A. W. Warner, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. A retort charging machine has electrically-operated indication for showing relative position of charges and retorts.

1,229,231. Lamp Locking-Base. W. A. Chew, Atlantic City, N. J. Has socket engaging shell and bulb engaging shell swiveled together and a frangible washer prevents outward movement of latter.

1,229,232. Electric Time-Switch. A. M. Coates, Middle Brighton, Melbourne, Victoria, Australia. Solenoid operated and controlled by air cylinder.

1,229,235. System of Railway Control. A. R. Craddock, Christchurch, New Zealand. System of track magnets controlled by a semaphore controls the train brakes.

1,229,266. Ignition System for Internal Combustion Engines. J. T. E. Hillhouse, New York, N. Y. Distributor has fixed set of contacts and adjustable set of contacts with rotating contact adjusted by centrifugal action to engage one set or the other.

1,229,272. Insulator. J. J. Irwin, Cleveland, Ohio. Pin type.

1,229,288. Electric Welding. O. A. Kenyon, New York, N. Y. Circuit of arc is opened external to arc at predetermined voltage.

1,229,294. Automatic Switch. F. A. Kuntz, assignor to Gold Car Heating & Lighting Co., New York, N. Y. When solenoid is energized it opens switch and acts as magnetic blow-out.

1,229,308. Electric Generator. J. C. Morgan, Los Angeles, Cal. Special arrangement of motor generator set in casing.

1,229,324. Process for Treating Silica. I. Rosenblum, Swampscott, Mass. Manner of treating quartz in an electric furnace.

1,229,345. Directional Trolley Contractor. S. S. Stolp, assignor to Railroad Supply Co., Chicago, Ill. For signal system.

1,229,347 and 1,229,348. Telephone-Call-Registering Device. V. Thompson, Vancouver, British Columbia, Canada. Coin-controlled devices.

1,229,349. Stand for Lamps and Other Articles. P. J. Timberlake, Jackson, Mich. Details of wire structure.

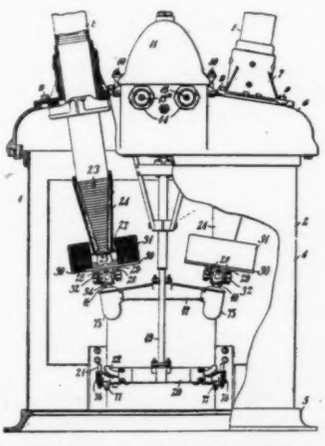
1,229,351. Ignition System. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Make and break igniter contacts have lock controlled by ignition current.

1,229,357. Apparatus for Coiling Material. W. R. Webster, assignor to Bridgeport Brass Co., Bridgeport, Conn. Automatic blocker has magnetizable block and flexible carrier which wraps around block and confines non-magnetic material between carrier and block when latter is magnetized.

1,229,358. Diagnostic Instrument. H. Weder, Sr., and C. H. Wolff, Philadelphia, Pa. Special structure of battery lamp, push button, reflector, etc.

1,229,409. Spark-Plug. M. G. Bunnell, assignor to G. C. Mastin and E. W. Stees, Rockford, Ill. M. C. Putnam, executrix of said G. C. Mastin, deceased, Chicago, Ill. Structural details.

1,229,420. Reflector. T. B. Dixon, New York, N. Y. Low-inertia, large-area reflector comprising a plurality of fibre suspended reflecting strips.



1,229,768.—Circuit Interrupter.

1,229,443 and 1,229,446. Accelerator and System of Control. A. J. Hall and L. G. Riley, assignors to Westinghouse Electric & Mfg. Co. First patent: Electrically controlled fluid pressure cylinder. Second patent: Above having piston connected to motor controller drum.

1,229,444. Control System. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co. Electro-pneumatic motor control.

1,229,458. Lighting Mechanism for Machine Tables. C. A. Hinsdill, Troy, N. Y. Arrangement of lighting fixtures on sewing machine tables.

1,229,460. Indicating Electric Connector. C. Horn, assignor to H. Hubbell, Inc., Bridgeport, Conn. Plug has lamp for indicating when connection is made.

1,229,463. Electric Signaling System. H. Hubbell. Grouping of circuits and controlling devices.

1,229,464. Pull-Socket. H. Hubbell. Structural details.

1,229,470. Electric Control System. N. Joleen, Chicago, Ill. Protective provisions for induction motor driving refrigerating pump.

1,229,474. Headlight. H. B. Kenyon, assignor to J. M. Richardson, Highland Park, Mich. Arrangement of high and low candle power filaments with relation to reflector focus.

1,229,483. Combined Signal and License-Plate. E. Libby, Montreal, Quebec, Canada. Structure of interiorly lighted casing.

1,229,489. Switch. A. J. Loguin, assignor to Allis-Chalmer Mfg. Co. Structural arrangement of main and auxiliary contacts in switch-board device.

1,229,493. Implement Holder for Type-Writing Machines. I. H. Mallin, Chicago, Ill. Mounting of magnet on machine frame.

1,229,515. Coin Controlling Mechanism for Automatic Photographing Machines. G. N. Pifer, assignor to F. E. Stewart, trustee, Cleveland, Ohio. Has coin-controlled circuit for operating motor.

1,229,530. Means for Operating Switch Mechanisms. R. A. Schoenberg, New York, N. Y. Socket structure operated by push on lamp.

1,229,538. Automobile Lamp. H. H. Slater, assignor to J. M. Richardson, Detroit, Mich. Arrangement of high and low candle power filaments with relation to optical axis and focal centre of reflector.

1,229,543. System and Apparatus for Controlling Fluid-Motors. N. W. Storer and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Electromagnetic control of valves of fluid pressure cylinder.

1,229,544. System and Apparatus for Controlling Electric Motors. N. W. Stores and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Electro-pneumatic control of step-by-step motor controller.

1,229,549. Signal-Bell for Railroad Service. E. W. Vogel, assignor to Chicago Railway Signal & Supply Co., Carpentensville, Ill. Has electric motor-operated clapper.

1,229,566. Switch-Point Operator. R. Alcolea, New Orleans, La. Railway switches are electromagnetically operated.

1,229,576. Outlet-Box. J. C. Boyton and O H. Nickerson, Cleveland, Ohio. Structural details.

1,229,596. Non-Grounded Repeater System. E. D. Fales, assignor to Automatic Electric Co. For automatic telephone system.

1,229,627. Starting Mechanism. A.

Loomis, assignor to Packard Motor Car Co., Detroit, Mich. Gearing of motor to engine.

1,229,634. Telephone-Transmitter. R. H. Manson, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Details of microphone.

1,229,635. Snap-Switch. F. W. Marschen and W. A. Marchke, Indianapolis, Ind. Structural details.

1,229,651. Means for Attaching Electrical Appliances to Conduit Outlet Boxes. J. E. Parker, assignor to Crouse-Hinds Co., Syracuse, N. Y. Member to which appliance is secured has holes for securing screws and is removably interlocked with marginal flange of outlet box.

1,229,665. Fitting for Electrical Conduits. K. Sixma, Brooklyn, N. Y. Manner of securing conduit and into outlet box and the like.

1,229,670. Starting-Switch. A. K. Sutherland, assignor to Trumbull Electric Mfg. Co., Plainville, Conn. Structural details.

1,229,689. Current Transforming and Rectifying Apparatus. J. B. Wantz, assignor to Victor Electric Corp., Chicago, Ill. Special structure of commutator is connected with a transformer having a spark gap across its terminals to protect from excessive voltage.

1,229,693. Adjusting Device for Bearing and Process of Manufacturing the Same. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Formed of punched parts welded together.

1,229,694. Surgical-Motor Casing. W. A. Winter, assignor to Kny-Scheerer Corp. A complete closure is formed by a two-part sterilizable shell.

1,229,699. High - Potential - Measuring Device. J. C. Armor, assignor to Westinghouse Electric & Mfg. Co. Two relatively variable condensers of different capacities are in series across potential and a spark gap across the larger capacity to indicate a maximum potential.

1,229,700. Electric Welding Process. C. B. Auel, assignor to Westinghouse Electric & Mfg. Co. Preparation of thin oxidizable sheet for welding.

1,229,703. Latching Device. H. G. Baxter, assignor to Westinghouse Electric & Mfg. Co. For holding knife switches closed.

1,229,705. Trolley-Wire Hanger or Catenary Systems. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Details of clamp engaging suspension cable.

1,229,719. Cut-Out. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Structure of magnetically-operated device.

1,229,727 and 1,229,728. Welding System. E. E. Eby and S. W. Farnsworth, assignors to Westinghouse Electric & Mfg. Co. First patent: Arc system operated from alternating source through a vapor rectifier and has auxiliary electrode for preliminary welding arc. Second patent: Arc circuit supplied through vapor rectifier and regulated by reactance in alternating circuit.

1,229,740. Measuring Instrument for Rontgen Rays. R. Furstenau, Berlin, Germany. Comprises a wheatstone bridge including a selenium cell.

1,229,748. Spark-Plug. G. L. Herz, New York, N. Y. Structural details.

1,229,750. Knife-Blade Switch. F. B. Holt, assignor to Westinghouse Electric & Mfg. Co. Structure of jaw members.

1,229,754. Electric Machine. C. F. Kettering and W. A. Chryst, assignors to Dayton Engineering Laboratories Co., Dayton, O. Starting system for internal combustion engines.

1,229,759. Support for Armature Cross Connectors. G. H. Krauskopf, assignor to Westinghouse Electric & Mfg. Co. Structural details.

1,229,767. Electrical Measuring Instrument. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. Manner of mounting jewel bearing and spiral spring acting on rotatable member.

1,229,768. Circuit-Interrupter. J. N. MaHoney, assignor to Westinghouse Electric & Mfg. Co. Oil switch with specially controlled impedance.

1,229,784. Shade for Electric Incandescent Lamps. F. R. Pope, assignor to Duhrssen & Pfaltz, Inc. Is screwed on additional threads at base of bulb.

1,229,785. Water-Stage Indicator. D. W. Proebstel, Treadwell, Alaska. Structure of commutator for an indicator device.

1,229,786. Electric Stove. J. W. Purnell, assignor of one-half to E. B. Fisher, Morristown, Tenn. Structure of device for cooking or heating.

1,229,789. Circuit-Interrupter. K. C. Randell, assignor to Westinghouse Electric & Mfg. Co. Arrangement for equalizing the currents traversing a number of parallel connected circuit interrupters.

1,229,794. Illuminated Toy Balloon and Lighting Effect. A. Salzer, New York, N. Y. Balloon has a chamber for lamp inside of balloon adapted to prevent heating and expansion of air within the balloon by the lamp.

1,229,796. Telegraph and Telephone System. J. Schiessler, Baden, near Vienna, Austria. Transmission line forms tuned oscillation circuit wherein oscillating signaling currents are superposed on permanent high voltage charge.

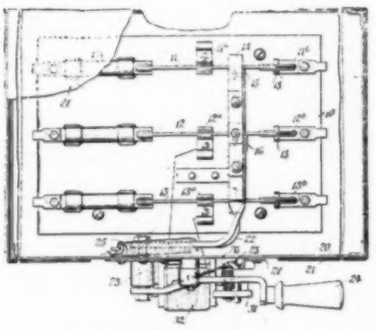
1,229,807. Automatic Electric-Railway System. K. E. Stuart, Philadelphia, Pa. Motor and brake of a car in one-track section are controlled by car in an adjacent section to bring the former car to a standstill.

1,229,823. Ignition Apparatus of Gas-Engines. C. S. Sydenham, Kilmarnock, Scotland. Plug structure with make-and-break electrodes.

1,229,841. Dynamo - Electric Machine. W. Weiler and H. Nehlsen, assignors to General Electric Co., Schenectady, N. Y. Polyphase machine with main and commutating fields and special displacement of armature windings to which collector rings and commutator are connected.

1,229,856. High-Frequency Alternator. E. F. W. Alexanderson, assignor to General Electric Co., New York, N. Y. Inductor type.

1,229,876. Magazine Arc-Lamp. J. Brockie, Forest Hill, London, England.



1,229,670.—Starting Switch.

Structure of electromagnetically controlled device for converging carbons.

1,229,886. Synthetic Production of Hydrocarbon Compounds. L. B. Cherry, Kansas City, Mo. Detailed electro chemical treatment of low gravity hydrocarbon liquid to produce high gravity hydrocarbon.

1,229,914 and 1,229,915. Electrical Condenser. P. Dubilier, assignor to Dubilier Condenser Co., Inc. Structural details.

1,229,931. Safety-Signal. C. R. Funk and L. H. Smith, Emporia, Kans. Electrically illuminated direction indicator.

1,229,939. Electrical Thermostat and Circuit. A. Goldstein, assignor to S. B. Hess, New York, N. Y. Details of alarm system.

1,229,950. Arc-Lamp. C. E. Harthan, assignor to General Electric Co. Details of feeding mechanism.

1,229,957. Cab-Signal System. R. J. Hewett, Westfield, N. J. Railway block system.

1,229,984. Electrically Controlled Hoist. S. H. Libby, assignor to General Electric Co. Means for operating and controlling a grab-bucket hoist comprising specially arranged and connected motor and magnetic clutch.

1,229,995. Cable-Pothead. G. F. Mainer, San Francisco, Cal. Structural details.

1,230,003. Safety Attachment for Synchroscopes. P. E. Means, Tyrone, N. M. Contacts for engagement with synchroscope arm are moved into engaging position by solenoid, energized when device is put in operation.

1,230,004. Incandescent Cathode Device. G. S. Meikle, assignor to General Electric Co. Gas-filled rectifier with main and starting incandescent cathodes.

1,230,030. Train Signaling and Stopping Device. K. Reger, Buckhannon, W. Va. Structure of electromagnetically operated selector switch.

1,230,046. Lighting Fixture. E. M. Smith, Chicago, Ill. Special globe structure for attachment to lamp socket casing.

1,230,063. Time-Limit Relay. G. A. Burnham, assignor to S. B. Condit, Jr., Brookline, Mass. Selective device for controlling circuit breaker is responsive in varying times to overloads of different values up to a certain value and above that operates in a fixed time for all current values.

1,230,077. Ignition System for Internal Combustion Engines. G. H. Silva, San Diego, Cal. Details of magnets and circuits.

1,230,083. Electropneumatic Valve for Air-Brakes. T. W. Scott, assignor to American Train Control Co., Baltimore, Md. Special arrangement with means for automatically preventing emergency application of brakes when train line is vented.

1,230,089. Switch. W. L. Hamilton, assignor to H. C. Avery, Holyoke, Mass. Structure of thermostatically operated device.

Patents Expired.

The following United States electrical patents expired on June 19, 1917:

651,817. Telephone Toll Apparatus. J. T. Belanger, Detroit, Mich.

651,826. Automatic System of Refrigeration. C. J. Coleman, Chicago, Ill.

651,827. Electrolytic System of Refrigeration. C. J. Coleman.

651,849. Electrolytic Apparatus. M. Haas, Aue, Germany.

651,850. Program Clock. W. H. Hall, Chicago, Ill.

651,853. Machine for Making Electrodes for Storage Batteries. W. W. Hanscom and A. Hough, San Francisco, Cal.

651,866. Incandescent Lamp. I. Kitsee, Philadelphia, Pa.

651,908. Magnetic Chuck. O. S. Walker, Worcester, Mass.

651,909. Electric Motor. H. O. White, Boston, Mass.

651,916. Furnace for Producing Calcium Carbide. J. Zimmerman and I. S. Prenner, Chicago, Ill.

651,936. Indicating Key for Selective Signals. C. E. Scribner, Chicago, and F. R. McBerty, Evanston, Ill.

651,945. Electric Motor. C. L. Bundy, Philadelphia, Pa.

651,978. Electric Belt. W. C. Sedwick, Des Moines, Iowa.

651,985. Electric Arc Lamp. A. B. Walton, Lorain, O.

652,003. Electric Railway. W. Kingsland, London, England.

652,013. Annunciator. C. E. Beach and H. W. Doughty, Binghamton, N. Y.

652,027. Transformer. S. E. Johannesen, St. Louis, Mo.

652,039. Trolley. G. W. Perry, Peoria, Ill.

652,084. Hotel Annunciator System. C. B. Clark, Sing Sing, N. Y.

652,116. Rheostat. T. F. Jordan, New York, N. Y.

652,124. Controlling Electric Motors and Apparatus Therefor. H. Leitner, London, England.

652,151. Automatic Electric Switch. P. S. Tirrill, Groveton, N. H.

652,187. System of Electrical Distribution. S. Krohn, Berlin, Germany.

652,188. Span-wire Pole and System. J. Lanz, Pittsburgh, Pa.

652,194. Electrical Incandescent Lamp M. von Recklinghausen and A. Vogt, London, England.

652,214. Apparatus for Measuring Consumption of Electric Currents. C. R. Loubery, Paris, France.

652,223. Electrical Warp Stop-motion for Looms. H. I. Harriman, New York, N. Y.

652,229. Reception and Translation or Retransmission of Telegraphic Signals. A. Muirhead, London, England.

652,230 and 652,231. Art of Reducing Attenuation of Electrical Waves and Apparatus Therefor. M. I. Pupin, Yonkers, N. Y.